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An assessment of the effectiveness of interaction in distance education based on student satisfaction with the learner-centered paradigm

by

Shu-Hui Hsieh Chang

A dissertation submitted to the graduate faculty

in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Industrial Education and Technology

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2006

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ABSTRACT

This study examined whether there were relationships between students' perceptions of course-related interaction and their course satisfaction within the learner-centered paradigm in distance education. To study these relationships, the researcher developed the Students' Perceived Interaction Survey (SPIS) to examine nine separate hypotheses about the nature of course-related interaction. The variables tested included: student-instructor interaction, student-TA interaction, student-student interaction, student-content interaction, gender, academic classification, students' prior experiences with distance education in a partially online class setting, students' prior experiences with distance education in an entirely online class setting, and students' perceptions of the effectiveness of WebCT features in helping them learn. This study used a volunteer sample of 855 students from the 949 students enrolled in Computer Science 103 at Iowa State University in the fall of 2005.

A multiple linear regression model was developed to study the relationship between different independent variables and course satisfaction. Multiple regression analysis includes many assumptions, including equality of error variances, independence, and normality of the residuals. All of these assumptions were examined and satisfied.

The study concluded that student-instructor, student-student, and student-content interactions, along with students' perceptions of WebCT features and gender were predictors of course satisfaction. No significant relationships were found between student satisfaction and student-TA interaction, the student's prior partial online distance education experience, the student's prior entirely online distance education experience, and academic year. The discussion section offered many suggestions on how to create a learner-centered online class environment, which includes encouraging online instructors to incorporate effective WebCT

features and increasing student-instructor interaction, student-student interaction, and student-content interaction. The results of this research can help educators create a rich distance education environment that encourages students to enjoy what they are learning and perform well.

CHAPTER 1: INTRODUCTION

Background of the Study

Distance education has become widely used around the country today (Jones, Morales & Knezek, 2005) and is available in a number of forms that reduce the time and space constraints present in traditional classrooms (Verduin & Clark, 1991). Distance education is especially advantageous because it makes learning accessible to students all day, every day. This 24-hour accessibility allows students immense control over their own learning schedules and encourages active involvement from students in making decisions regarding their learning process (Dede, 1996). Within this new educational paradigm, the design of virtual classrooms provides students with an environment that allows them to access information conveniently and easily (Ko & Rossen, 2001).

According to Perez's (2001) research, many students reported that the main disadvantage of distance education was a lack of interaction between the instructor and the students. Opportunities for students to meet with their instructor in a face-to-face environment were nonexistent, preventing students from asking questions and exchanging non-verbal cues with the instructor (Perez, 2001). Moreover, the chances for students to discuss questions with other students were limited in the virtual online classroom environment. Ritchie (1993) and other researchers have pointed out that lack of interaction is a factor that handicaps students' learning abilities and impairs their academic success (Henri & Kaye, 1993).

According to Rost's (2000) research regarding distance education, online instructors utilized forms of technology that lacked personal interaction, decreasing the quality of education. Therefore, interaction, the effectiveness of technology, the quality of distance

education courses, and students' satisfaction with distance education are all factors that require further research. Although many studies have considered various variables related to student performance and satisfaction, few studies have examined the relationship between interactivity, the effectiveness of technology used in distance education, and course satisfaction levels of distance education learners. Concerns about the quality of distance learning can be addressed better if researchers understand how students perceive interaction in virtual classrooms and how these students believe the effectiveness of technology contributes to their learning. Understanding these student perceptions will allow online educators to measure and evaluate online courses better (Verduin & Clark, 1991).

Problem of the Study

This study aims to determine whether there is a relationship between students' perceptions of how effective course-related interaction is and these students' levels of course satisfaction. These variables can be measured by the Students' Perceived Interaction Survey instrument (SPIS), developed by the researcher of the study within the learner-centered paradigm in distance education.

Purpose of the Study

This study has three purposes:

1. To identify the relationships between student-instructor interaction and course satisfaction, student-TA interaction and course satisfaction, student-content interaction and course satisfaction, and student-student interaction and course satisfaction.
2. To identify the relationship between students' perceptions about the effectiveness of WebCT features for their learning and course satisfaction.

3. To identify the relationships between course satisfaction and specific student attributes such as gender, academic classification, and prior distance education course experiences.

Need for the Study

Within the last decade, distance education has exploded in popularity (Roberson & Klotz, 2001; Phillips, 1999). This popularity is reflected in the fact that about 90% of the colleges and universities in the United States utilize web-based courses (Jones, Morales, & Knezek, 2005). Because these web-based courses have grown to be so popular, the course content must be developed effectively to maximize student learning. When creating and developing online courses, it is important to use a well-developed and effective course management system to ensure quality. According to Ko and Rossen (2001), several commonly used online course management systems exist, including WebCT, Blackboard, eCollege, LearningSpace, CourseInfo, and many others. All of these course management systems support online learning.

A number of studies have investigated the use of WebCT, specifically, in relation to the effectiveness of online learning. According to Howell's research (2000), many institutions from around the world have used WebCT as an instructional platform for web-based courses. At Iowa State University, WebCT has become a commonly-used web course management tool, and is used as a supplemental tool in most traditional face-to-face courses (Yang, 2002). Although WebCT is a popular online course management system, many course instructors have not fully explored the various features provided by this course management software. Therefore, many course instructors have not created an effective distance education environment for their students. Also, many course designers are unaware of how to apply modern technologies effectively in online classes (Chinn, 1990; Olson &

Wisher 2002). For example, technology like streaming video can be used to create better course material that enhances students' learning experiences. Examining the effectiveness of course management systems in distance education is important, as findings enable educators to create more effective course content and promote student learning.

Studying the effectiveness of the WebCT-based learning environment from the student's perspective is crucial, especially in terms of students' experiences regarding their interactions and course satisfaction within the WebCT environment. By collecting students' opinions on their distance education experiences, educators can tailor their courses more effectively to increase students' course satisfaction. Identifying and investigating students' levels of course satisfaction in relation to student-instructor interaction, student-TA interaction, student-student interaction, student-content interaction, students' perceptions of the effectiveness of WebCT features for their learning, students' prior distance education experiences, gender, and academic classification is the focus of this research.

Hypotheses of the Study

First Null Hypothesis:

There is no positive relationship between students' scores on the student-instructor interaction items in the SPIS instrument for distance education and students' scores on the course satisfaction items in the SPIS instrument for distance education.

Second Null Hypothesis:

There is no positive relationship between students' scores on the student-TA interaction items in the SPIS instrument for distance education and students' scores on the course satisfaction items in the SPIS instrument for distance education.

Third Null Hypothesis:

There is no positive relationship between students' scores on the student-student interaction items in the SPIS instrument for distance education and students' scores on the course satisfaction items in the SPIS instrument for distance education.

Fourth Null Hypothesis:

There is no positive relationship between students' scores on the student-content interaction items in the SPIS instrument for distance education and students' scores on the course satisfaction items in the SPIS instrument for distance education.

Fifth Null Hypothesis:

The mean score for the female participants is equal to or greater than the mean score for the male participants on the course satisfaction items in the SPIS instrument for distance education.

Sixth Null Hypothesis:

There is no positive relationship between students' academic classification and students' scores on the course satisfaction items in the SPIS instrument for distance education.

Seventh Null Hypothesis:

There is no positive relationship between students' amount of prior distance education experience in partially online class settings and the students' scores on the course satisfaction items in the SPIS instrument for distance education.

Eighth Null Hypothesis:

There is no positive relationship between students' amount of prior distance education experience in entirely online class settings and students' scores on the course satisfaction items in the SPIS instrument for distance education.

Ninth Null Hypothesis:

There is no positive relationship between students' scores on the perceptions about the effectiveness of WebCT features items in the SPIS instrument for distance education and students' scores on the course satisfaction items in the SPIS instrument for distance education.

Limitations of the Study

1. The participants of this study were the 949 students enrolled in Computer Science 103 during the fall of 2005 at Iowa State University. Computer Science 103 used WebCT as a primary resource to assist students in the process of learning course material. However, the results of this study may not apply to other course management platforms.
2. The convenience sample method was employed in this study.
3. This study used the level of student course satisfaction as the only measure of course quality. Other measures, such as students' grades, were not examined.
4. This study examined only students' perceptions of the relationships between interaction and course satisfaction; it did not examine the impact of instructors' teaching styles or students' different learning styles and course satisfaction.

Procedure of the Study

1. Conduct a literature review on interaction in distance education, the learner-centered paradigm, and student course satisfaction.
2. Determine that the 949 students in Computer Science 103 at Iowa State University will participate by completing the survey during the fall of 2005.
3. Develop surveys.
4. Obtain approval from the Human Subject Review Committee (see Appendix A).

5. Select Samples.
6. Conduct a Pilot Test.
7. Distribute surveys and cover letters through the WebCT assessment system to the participants and inform students that their participation is completely voluntary and anonymous.
8. Collect the anonymous surveys within the course of one week through the WebCT assessment system.
9. Collect and analyze data from the surveys.
10. Document findings, draw conclusions, and suggest future research.

Definition of the Terms

Course satisfaction: a measurement determined by students' scores on the course satisfaction items in the students' perceived interaction survey (SPIS) instrument for distance education that was developed by the researcher of this study.

Distance education: "Distance education is planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organizational and administrative arrangements." (Moore & Kearsley, 1996, p. 2)

Effectiveness of the interaction: a measurement determined by students' scores on the student-instructor interaction items, student-TA interaction items, student-student interaction items, and student-content interaction items on the SPIS instrument for distance education that was developed by the researcher of this study.

Learner-Centered: "The perspective that couples a focus on individual learners (their heredity, experiences, perspectives, backgrounds, talents, interests, capacities, and needs) with a focus on learning (the best available knowledge about learning and how it occurs and about teaching practices that are most effective in promoting the highest levels of motivation, learning, and achievement for all learners)." (McCombs & Whisler, 1997, p. 9)

SPIS instrument: Students' Perceived Interaction Survey Instrument. Please see Appendix C.

WebCT: A course management system (CMS) originally developed by the computer science department at the University of British Columbia, Canada. WebCT provides many active tools for designing web-based courses (Goldberg, 1997).

CHAPTER 2: LITERATURE REVIEW

In an educational setting, interaction through communication and collaboration is the most central mechanism educators use to encourage students to become active learners. Therefore, interaction also plays a key role defining the effectiveness and quality of distance education. Throughout the evolution of the distance education system, interactive processes, especially those that imitate the interactive processes in the traditional face-to-face classrooms, have been attracting special attention. There are an insufficient amount of interactive learning opportunities within the online course environment; this deficiency is considered one of the major downsides of distance education (Perez, 2001). In response to this lack of interaction, educators are attempting to make the online learning environment more interactive. These efforts, based on historical contextual factors and research on teaching and learning, have resulted in many changes and adaptations to the distance education environment. The knowledge this research has produced has led educators to better appreciate the importance of interaction in all educational settings.

This literature review will examine the four different categories of distance education courses and the amount of influence these categories have had on distance education as a whole, the significant role interaction plays in distance education, and some of the deficiencies associated with interaction. Knowing the categories of distance education courses is an essential aspect of being able to understand the roles interaction has played in education and the modifications that have been executed within educational settings to increase the level of interaction and create an atmosphere conducive to effective learning. Even though research supports interaction and credits it as an effective approach to learning, it is also important that a more extensive understanding of the role of interaction within

distance education is acquired. In order to acquire this understanding, the shortcomings of interactive learning must be examined. Awareness of multiple perspectives that relate interactive learning to distance education is important so educators can be more informed in making decisions related to the amount of emphasis they choose to place on interaction in their own distance education classes.

This research will focus on a number of major shifts within the learner-centered paradigm. By examining some of the more notable changes in the area of education, educators are enabled to recognize the progress of distance education and make pedagogical decisions based on the most recent, up-to-date research. Although educators have made important progress in designing online courses that make the most of students' abilities to learn, this research observed how effective interaction is in online distance education courses. Because learning is a lifelong endeavor, it is crucial that educators always be willing to modify their teaching practices and be open to experimenting with new ideas to make an interactive learning environment that directly serves the individual learning needs of students.

The Virtual Classroom: The New Paradigm of Modern Education

Distance education via web-based instruction combines various technologies, such as two-way video and computer-mediated communication, to enhance the interaction and learning of students. Throughout the years, the Internet has become an invaluable asset to distance education, allowing educators to provide lecture notes, images, animations, audio and video, and many other resources to further enhance student learning (Buikema & Ward, 1999). Another notable benefit of these Internet features is that teachers can implement them in a way that makes the course design compatible with students' individual learning styles.

These features permit students to be flexible with their learning, allowing them to re-read and re-play the course material to ensure they fully understand the content (Lynch, 2002). As a result, distance education enables students to play an active role in the learning process by giving them the opportunity to make decisions based on their prior knowledge and current understanding of the course content.

Distance education provides flexibility and convenience for learners because students have control over their own schedules and the pace at which they learn the course material (Draves, 2000). According to most of the research in the field, the learning outcomes of distance education courses are equally effective and are often perceived as being more advantageous when compared to the learning outcomes of traditional face-to-face courses (Motiwalla, Shea, & Lewis, 2000; Neumann & Shachar, 2003; Olson & Wisher, 2002; Shapley, 2000). Verduin & Clark (1991), in examining a variety of studies on student success in the distance education environment, found that students typically performed at the same level or better in the distance education environment than they did in a normal, face-to-face classroom setting, dispelling the notion that distance education was not as effective as the standard classroom in helping students learn.

Online distance education increases interaction between students and the instructor and students and their fellow classmates. Computer-mediated communication facilitates group discussions through threaded virtual bulletin boards and chat rooms, enabling students to develop a sense of community and receive clarification regarding their understanding of the course material. The instructor can use the discussion board, the chat room feature, and many other tools provided by the course management system to facilitate online discussions and establish a learning community. This sense of community is thus perceived as an

invaluable asset to student learning because it can provide instructor to student, teaching assistant to student, and student to student support (Buikema & Ward, 1999). When the instructor successfully built an online community, students reported they felt they got to know their peers and instructor better than they ever did in the traditional classroom, and actually learned more. Also, the instructor reported that students' reflections on discussion postings and written assignments were more thoughtful than those from students in the traditional classroom (Berge & Collins,1995; Gunawardena, 1992; Lynch, 2002).

Besides helping students see writing as a valuable activity, more benefits of distance education reside in the accessibility and affordability of the course material via the Internet for many groups of people (Draves, 2000; Marsh, Price, & McFadden, 2000). The accessible nature of this material allows universities to educate more students while charging less for tuition (Porter, 1997). Distance education provides students who otherwise may not have been able to enroll in courses with an opportunity to pursue a college degree. Also, the web-based method prevents discrimination because it takes away restrictions of education that are determined primarily by economic strata and demographic factors such as age and ethnicity (Ko & Roseen, 2001), family responsiblities, physical distance from campus, work schedules (Wyatt, 2005), and students' physical characteristics. Attributes like disabilities and appearance are unknown to course instructors (Harasim 1987). Distance learning also provides equal opportunities for all types of students to express themselves, especially introverted or timid individuals who may not feel comfortable vocally expressing their viewpoints within traditional classroom settings. The online environment, however, allows instructors to encourage students to contribute their viewpoints through posting messages on the discussion board. This discussion board feature allows students to craft their thoughts

carefully and reflect on their writing before expressing their ideas to a group of people (Rohfeld & Hiemstra, 1995). The distance education setting also provides great educational opportunities for students who have time or geographic constraints, demanding family responsibilities, or struggle with disabilities or illnesses. Within traditional classrooms, opportunities for further education may have been restricted for these types of people; however, the adaptable features of distance education make it possible for students of diverse backgrounds to pursue a degree and excel in the world of academia. The virtual classroom has become the new paradigm of modern education, and is extraordinarily beneficial to many people around the world (Draves, 2000).

Categories of Distance Education Courses

To examine thoroughly the current status of the distance education field, one should study the factors that defined and influenced the current designs and contents of distance education. In a world that constantly is developing new technologies, understanding these factors is even more important to anticipate and effectively modify even the newest educational methods to correspond with the newest technologies. Distance education courses can be separated into four categories: written correspondence education, audio/video broadcast education, interactive teleconferencing, and Internet-based education courses. Even though each category uniquely contributes to the development of distance education, an increase in interaction is a characteristic that most of the categories share.

First Category: Correspondence Courses

Distance education began with correspondence classes (Verduin and Clark, 1991). These classes allowed teachers to send course material through mail services to their students, allowing students to study either at home or at work. In the United States, the first

correspondent college to offer degrees and diplomas was Chautauqua Correspondence College, which was founded in 1881 (Moore, 1989). The idea caught on fast; there were more than 200 correspondence schools by 1910 (Garrison, 1989; Young, 1984). These schools, in turn, inspired similar initiatives all around the world (Moore & Kearsley, 1996).

Students who participated in correspondence education received printed course material by mail, completed the homework at home or at work, and returned it to the instructor. The instructor then graded the homework and sent it back to students through the mail (Mood, 1995). According to Misanchuk (1997), correspondence courses were beneficial because they allowed students to work on homework at their own pace within periodic deadlines, yet presented opportunities to take their examinations in a proctored environment. However, the primary limitation of correspondence classes was the lack of student-instructor interaction. This deficiency was especially detrimental for students who found the material difficult because they did not have the resources available to contact the instructor in a timely manner.

Second Category: Audio / Video Courses

As time progressed, developments in technology began to render the correspondence method of distance education somewhat outdated. Radio, broadcast television, and videocassette forms of distance education were released. However, the educational community did not immediately accept these forms of communication. According to Brey (1991), people had concerns about the effectiveness of telecommunicative distance education; these concerns prevented television and other various technologies from gaining immediate acceptance as an effective means of distance learning. While these new forms of distance education media stimulated more of the senses and were more interactive than a

standard text-based course, minimal interaction still existed between the students and the instructor and students and other students. However, these forms of distance education still followed a model of education that believed knowledge should be disseminated and distributed from a central source to all the participants.

The advancement of radio prompted institutions to begin to develop and distribute teaching material using voice communication, and then moved from the purely audio world of broadcast radio to audio/video, a medium that provided visual, as well as audio interaction. However, these videotapes still provided minimal interaction between instructors and students, promoting passive interaction; merely being able to see and hear the instructor did not engage students in interactive learning (Brey, 1991). As the videocassette recorder became popular, though, many institutions began to utilize videocassettes extensively. This type of material allowed learners to see and hear the instructors' demonstrations, reducing feelings of isolation in the virtual class environment. The learners became visually involved with the teaching material, thus enhancing information retention. When the instructors showed the process of repairing machinery and other hands-on simulation processes, the learners had a much greater understanding of the course material when they physically saw the instructors modeling the procedures. The videocassettes became useful teaching and learning tools for both instructors and students (Porter, 1997).

An additional medium that advanced along with the development of the computer was the CD-ROM. CDs became a very popular resource in distance education courses as institutions began to develop course content, press CDs with that content, and send them out to students as supplemental materials for their classes (Brey, 1991). Due to the benefits of the CD method, many institutions still frequently use CDs today to deliver distance education

course content.

Broadcast television, another form of passive distance education, has been used extensively to transmit courses. Many colleges have used this technique to broadcast different types of courses. One example of a university that offered highly structured telecourses for regular credits through distance education was the University of Alaska (Porter, 1997). Because these courses allowed students to learn at their own pace and provided both audio and visual information, many students started attending college level TV courses (McKune, 1967).

Brey (1991) stated that although broadcast television was popular in distance education, it also had several disadvantages. For example, broadcast television only allowed a 70-mile coverage area from the transmission tower, and also limited student and instructor interaction. However, several improvements have been made in the quality of broadcast television, beginning with the introduction of cable television, which now makes it possible for two-way communication to occur. Also, the satellite communication system was used by colleges, universities, and many companies to develop distance education programs for training via satellite. However, disadvantages of the satellite communication system included the cost and the complexity of the technology (Moore and Kearsley, 1996).

Despite all these innovations, these different modes of technology facilitate minimal interaction since students can only hear or view the course material without having the chance to ask questions and interact with the instructors and other students (Oliver, 1997).

Third Category: Interactive Teleconferencing

In an attempt to provide a better educational environment, developers of distance education technologies explored ways to make distance education more interactive. One of

the most recent developments, perhaps the first truly interactive form of distance education, is teleconferencing. By using two-way audio and video communication, students at several different classroom sites can see and hear the instructors from the original site. Another method that employs similar technology is desktop conferencing, which allows instructors to connect to students using their own computers. By using cameras and microphones, students can see and hear the instructor and their fellow students.

According to Porter (1997), teleconferencing and desktop videoconferencing settings are the distance education techniques most closely related to the traditional classroom because instructors and students can see and hear each other simultaneously. Students have the opportunity to ask questions and receive explanations and clarifications from the instructor in a timely manner. Before the class sessions take place, the instructors can ask learners to work at understanding the course material and finishing the class assignments at their own pace. Because students have already spent time individually learning the material, the instructors can use teleconferencing or the desktop videoconferencing method to exchange their viewpoints, visually demonstrate different concepts, and discuss questions. Just like in the traditional classroom, the instructors can use transparencies and other visual aids to show the teaching material in a live presentation.

While teleconferencing and desktop videoconferencing are helpful in many circumstances, drawbacks do exist when dealing with these types of technology. Both teleconferencing and desktop videoconferencing require a great amount of structure because teachers and learners must agree to meet at a designated time or location. Porter (1997) stated that the types of software and equipment used will affect the quality of the desktop conferencing. Equipment required to provide a good quality picture was expensive, making

the cost of teleconferencing another concern. Some individuals might not have the financial resources available to purchase the equipment.

Culnan and Markus (1987) emphasized that television technology could not facilitate the face-to-face interaction that happened in traditional classroom settings because the visual images provided by the television were most likely distorted or blurred. Despite significant advances in technology, television pictures may still emphasize distance for students, because regulating the nonverbal level flow of conversation is difficult when discussion participants are not physically present. Students may also have trouble forming impressions of the various speakers and keeping track of the nonverbal cues that guide the process of communication in a mediated class.

The effects of two-way visual contact on interaction were studied by Bauer and Rezabek (1993) by exposing students to one of the following possibilities for a distance education environment: (1) a teleconference setting in which students had two-way audio and video contact with the instructor; (2) a teleconference setting in which the students only had audio contact with the instructor; and (3) a face-to-face setting in which the instructor was physically present. The results showed that students using the teleconferencing methods, with video or without, did not participate as much as students who were exposed to the face-to-face classroom setting. Also, there were no significant differences in how often the students interacted between the option that offered audio with no video and the option that offered both audio and video.

Because there were infrequent observations of interaction between the students and the instructor at remote sites, Bauer and Rezabek (1993) drew the conclusion that an image of an instructor on a screen is not enough to encourage sufficient interaction to positively

influence students' learning. Richie and Newby's (1989) research also found that simple images of the instructor were not enough to promote meaningful interaction between students.

Gutenko (1991) questioned the ability of television to accurately convey the mood of a conventional class setting because the medium of television filters and scales down what occurs in real life. Garrison (1989) also questioned teleconferencing, and came to the conclusion that the system had both advantages and disadvantages. While the technology had great potential to positively affect education and was easy for people to watch and engage in, it also provided numerous opportunities for technical difficulties. Garrison also found that audio-video conferencing seemed to have a relative advantage over teleconferencing that provided only audio communication. Therefore, fully interactive two-way video should have mimicked a traditional classroom setting very closely. This two-way video, though, was enormously expensive, requiring extensive funds for production, set-up, and transmitting the footage, explaining why the market had not embraced this medium of communication. In addition, educators started to realize that full-motion videos usually are not crucial; less-expensive media worked fine to overcome barriers between class participants.

Garrison (1989) also found that even though teleconferencing accommodates visual interaction, some students felt nervous and intimidated by the cameras. The presence of these cameras, along with the complex practices of video teleconferencing, are hindrances to using these techniques for education. Most educators do not have the technical equipment, knowledge, or funds to take a large risk to attempt to create an effective video teleconferencing environment.

Stork and Sproull (1995), while studying television interactivity at a large university offering master's level courses, interviewed people who frequently used interactive video in a corporate environment. These people reported having a difficult time figuring out who the person giving instructions in the video was and what he or she was doing. Because the nonverbal cues were missing, people were unable to assign an identity to the video instructor, hindering their ability to interact. These comments led Stork and Sproull to conclude that specific nonverbal cues are essential to interpreting responses accurately and keeping the flow of communication going in an interactive television environment. Hillman, Willis, and Gunawardena (1994) pointed out that significant obstacles may arise if the video-audio technology is not used efficiently or if the technology somehow makes students uncomfortable despite the fact that two-way interaction is achieved through audio-video distance education.

Teleconferencing is not the only form of interactive audio-video distance education, even if it is the most common option. Desktop video conferencing is a more recent development that involves computers with special computer microphones and cameras, allowing students to hear and see each other while they stay at home. This method requires a high bandwidth for quality viewing, resulting in greater expense; however, benefits are numerous (Porter 1997).

Fourth Category: The Advent of the Internet

Innovations in Internet technology have great impact on both a national and a worldwide level. Draves (2000) commented that the Internet has the most power for dramatic changes in the educational system since printed books came out more than 500

years ago, potentially replacing the traditional classroom and allowing students to learn when and wherever they want from different people all over the world.

Because the Internet is so accessible, it allows students to connect with each other despite lack of physical presence and time constraints. Students can communicate and collaborate with other students locally, nationally, and globally through quick computer networks and accessible global resources. According to Lynch (2002), advantages of the computer-based Internet learning environment include: (1) instructors can develop rich course content that is available to students at all locations without time constraints; (2) learning communities can be constructed within the online environment, saving travel expenses and time for both students and instructors; (3) instructors can develop teaching materials that accommodate different learning styles. Text, audio, video, graphics, and many other multimedia teaching technologies can be employed in the virtual classroom to enhance students' learning; (4) instructors have more time to communicate with students through an email system, the discussion board feature, or other effective tools provided within the course management system that encourage students to learn actively; (5) students become lifelong learners and enjoy the learning process.

In relation to the role of technology in distance education, Mingle (1995) identified four interrelated factors that evolved along with the growth of technology in university educational settings: (1) provision of updated information from teachers via distance education technology, (2) concentration on learners rather than teachers in the educational system, (3) availability of accessible information to people worldwide, (4) variety of media available to students for learning assistance. Online class settings can provide a better environment for assisting online students than a traditional classroom environment due to

effective networks, knowledgeable instructors, good staff support, and excellent learning material (Lynch, 2004).

As web-based instruction becomes more popular, it is crucial to evaluate the learning achievements of students. Many researchers compared the results of teaching in traditional classrooms with teaching in partially online or entirely online classroom environments. Olson and Wisher (2002) examined reports of 47 studies evaluating Web-based distance education courses in higher education that were published from 1996 to 2002. They concluded that Web-based instruction is at least as effective as face-to-face classroom instruction. Furthermore, they analyzed reasons why some of the web-based instructions were not adequately communicated in these types of distance education online environments. They found many web-based courses were taught by faculty who did not have sufficient training in online instructional design and teaching, which hindered the effectiveness of the online environment.

Neumann and Shachar (2003) examined 86 studies on distance education conducted from 1990 to 2002, evaluating results from more than 15,000 students who provided input on distance education practices. These results showed that a two-thirds margin of students taking one or more distance education courses were reported to perform better than students taking traditional classroom courses. Also, Newmann and Shachar's results were consistent with the research of Motiwalla et al. (2000).

New Education Model: The Shift to a Learner-Centered Paradigm

Olson and Wisher (2002), in examining 47 studies on Web-based courses in higher education, found many cases where faculty members were not trained adequately in online instructional design. In addition, McCombs and Vakili (2005) claimed that this lack of

knowledge stems from lack of information on online course design in general. Some researchers are skeptical of real-time classroom concepts working in the online environment; therefore, a need exists for theoretical and empirical research on course design principles for online instructors (Bonk & Cummings, 1998; McCombs, 2000, 2001a, 2001b; McCombs and Vakili, 2005).

The American Psychological Association addressed this concern and developed 12 learner-centered principles in 1990, then revised the list into 14 learner-centered principles in 1995 (Alexander & Murphy, 1998). McCombs and Whisler (1997) defined the learner-centered paradigm based on these principles:

> The perspective that couples a focus on individual learners (their heredity, experiences, perspectives, backgrounds, talents, interests, capacities, and needs) with a focus on learning (the best available knowledge about learning and how it occurs and about teaching practices that are most effective in promoting the highest levels of motivation, learning, and achievement for all learners). (p. 9)

They concluded that teachers should include learners in decisions about learning processes and respect students' individual backgrounds and abilities while simultaneously focusing on promoting motivation, overall achievement, and learning. This model has become a key component for online distance education, breaking from the traditional teaching model.

Alexander and Murphy (1998) summarized these 14 principles into five categories that served as a guide for developing the learner-centered classroom: (1) Knowledge base: being familiar with students' prior levels of knowledge because new knowledge is constructed based on prior knowledge; (2) Development and individual differences: developing awareness of the individual learning experience and being respectful of diverse

learning methods; (3) Strategic processing or executive control: allowing students to have control over their own learning and encouraging them to reflect on their learning progress; (4) Motivation and effect: providing choices that motivate active learning; (5) Situation of context: building a social learning community.

These principles become fundamental methods in guiding educators who design and evaluate online courses. Bonk and Cummings (1998) implemented these methods when they conducted a research study at Indiana University at Bloomington that spanned three semesters. The online courses Bonk and Cummings studied were designed based on these 14 learner-centered principles. A total of 53 students participated in the study; in addition, 300 pre-service teachers joined alongside the web-based students in electronic forums. Participants who were interviewed during these course experiences indicated that the electronic readings, class discussions, debate topics, reflection assignments, visual presentation of the information, and web research were all very informative. These students were also impressed with the learner-centered pedagogical activities employed in these web-based courses. As a result, Bonk and Cummings made the following learner-centered web environment recommendations: (1) establish a safe environment and a sense of community by using the electronic "Coffee House" or "Personal Profile" features on the discussion board, (2) demonstrate the potential the electronic medium has to engage students deeply by guiding web debate, (3) facilitate choices by allowing students to determine what class assignments they want to complete, (4) assist and guide students instead of dictate, (5) employ public and private forms of feedback for the instructor to communicate with the students, (6) vary the forms of electronic mentoring and apprenticeship by providing advanced undergraduate students as mentors, (7) utilize recursive assignments that build

from personal knowledge, like using the discussion forum to encourage students to share the characteristics of their favorite teacher, (8) contrast the forms of electronic writing, reflection, and other pedagogical activities by facilitating debate over chapter information and their peers' ideas, (9) use student web explorations to enhance course content by encouraging students to do research on the web and share the information they collect with others, (10) provide clear expectations and prompt task structuring by providing clear electronic syllabi, (11) embed thinking skills and portfolio assessments as an integral part of web assignments by presenting student portfolios and facilitating peer evaluation and cooperative group assignments, (12) look for ways to personalize the web experience by using videoconferencing or chatting with an expert.

Chou (2001) conducted a research study at the University of Hawaii on an upper level undergraduate course that was based on learner-centered instructional design and employed constructivist and small group cooperative learning activities in the curriculum. The study was conducted through WebCT and other computer media communication systems such as Palace and Active World. Chou identified two elements that impact the different patterns of interaction, one being the design of leaner-centered online activities. These activities, which include student-moderated discussion, small group cooperative learning projects, and constructivist-based instructional activities, were found to enhance interpersonal relationships and increase opportunities for students to share information and build knowledge while collaborating with others. They also allowed students to express their viewpoints and take responsibility for their learning to reduce confusion in the online environment. The second element Chou identified was the technological attributes that enhance social presence and effective communication. Student perceptions of the

technological attributes of the course management system might affect how frequently they choose to engage in online interaction. In order to promote student learning and interaction, the instructors should help students get familiar with the technology at the beginning of the semester. The faster the students can learn the technological features needed to complete coursework, the faster they can concentrate on learning the course material. In Chou's study, out of a variety of different course management systems, students rated the WebCT chat feature to be the most straightforward and reliable. These research results showed that the incorporation of learner-centered instructional design and constructivist and cooperative activities into distance education enhanced student learning. Well-planned, synchronous activities executed through a well-designed and trustworthy course management system can indeed promote student interaction and active learning.

WebCT Course Management System

WebCT is a course management system (CMS) originally developed by the computer science department at the University of British Columbia, Canada. WebCT provides many active tools for designing web-based courses (Goldberg, 1997). Morss (1999) conducted a three-semester study at Creighton University to examine students' reactions to the WebCT environment, concluding that WebCT helped students concentrate on the subject at hand, helping them learn faster. Morss also determined that WebCT provided a great opportunity for both instructors and students to be exposed to distance education technology. However, since Morss' study in 1999, several newer versions of WebCT have been released. A more recent study by Lai (2004) examined the effectiveness of the WebCT interface design at the University of Idaho. Based on the responses of 140 students enrolled in either partially online or entirely online courses, Lai concluded that students' perceptions on how usable the

courseware was proved to be a significant factor in their acceptance of online courses. Additionally, the participants reported that their WebCT courses were easily navigable, and that they were pleased with the design of the WebCT courseware.

Carol (2000) conducted research on an undergraduate psychology course at the University of Missouri-Columbia from January to May in 1999. Carol's research compared a course that was taught through WebCT to a course that was taught entirely in the traditional face-to-face class environment. Of the 502 participants enrolled in the psychology class, 248 participants were in the experimental group that took the course in an entirely online environment for the entire semester. The control group consisted of 254 students who were taught in the traditional face-to-face classroom for the first eight weeks of the semester, and then were switched to the Web-based materials in the remaining eight weeks. The results were measured by grades between the two sections overall. These results suggested no differences in learning outcomes between the two groups. However, the amount of time that individuals spent on the website was a strong predictor of the grade a student received. Furthermore, the student satisfaction rates rose after the control group students were switched to the web-based teaching method.

Basile and D'Aquila (2002) studied students' attitudes in an entirely online WebCT environment and the traditional course setting in the area of financial accounting. The results suggested no significant differences in students' attitudes between the two settings. However, the students who used computers more often were more satisfied with the course delivery methods.

Cheng-Chang (2003) studied student perspectives regarding use of the WebCT system. The results indicated that students' attitudes toward WebCT predicted their learning outcomes, which were measured by end-of-semester grades.

Research conducted by Robertson and Klotz (2001) reported that several WebCT features can help online educators develop effective online courses in higher education. They identified several WebCT features that can help online educators address the learner objectives: the syllabus tool can help students understand and prepare for class requirements, the chat feature can provide real-time communication and an environment where groups can interact, the discussion board feature can promote communication between instructors and students, and the e-mail feature can facilitate one-on-one communication between the instructor and students, and students and students. Sabine (1998) examined the effectiveness of teaching foreign languages through WebCT. The results suggested that WebCT provided a user-friendly environment and a whole suite of features that can increase teaching effectiveness. These features included: (1) the communication tools such as e-mail, bulletin board, and chat rooms, (2) the assignment tools, such as the self-test and quiz tools, (3) the course management tools, such as my record, the calendar, and student management. Freeman and Field (2004) gauged student reactions to the WebCT supplemental materials for a Safety in Manufacturing course. The results suggested that students thought the course notes, grade book, and online quiz tools were the most useful WebCT features.

LeRouge, Blanton, and Kittner (2002) conducted research to examine the effectiveness of collaborative team projects using collaborative group features provided by WebCT and other course management systems. They found the WebCT collaborative group tools like e-mail and the discussion board can enhance student learning outcomes and

facilitate successful student collaborative group projects. Kendall (2001) studied the experience of using WebCT for a community information module at Manchester Metropolitan University from 1999 to 2000, finding some correlations between students' levels of class participation and earning higher grades.

Hoskins and Hooff (2005) studied student motivation and abilities and found that the more messages that the students posted on the discussion board, the higher levels of achievement they reached in the course. Auyeung (2004) examined WebCT effectiveness by using the discussion board feature to build a collaborative online learning community. The results suggested that the WebCT discussion board feature can promote online collaboration activities. Spiliotopoulos and Carey (2005) also investigated the role of identity in writing using electronic bulletin boards. The research examined the effectiveness of utilizing the WebCT discussion board to help international students learn English. The results suggested that the electronic bulletin board strongly motivates students to learn and encourages their participation in discussion board activities. The discussion board can help students share their cultural backgrounds and viewpoints to build an online community. Hutchins (2001) performed research in an online business communication course through WebCT at the University of North Texas. He concluded that WebCT offers several active tools, such as e-mail, chat rooms, group presentation features, conferencing abilities, and the discussion board, which can all make online meetings and project collaboration productive and effective.

As of February 2006, more than 1,800 colleges and universities in 90 countries used WebCT (WebCT, 2006) to manage totally online courses or supplement traditional face-to-face classroom courses. One of the major benefits of WebCT is that instructors can

incorporate a variety of tools into their online courses and facilitate meaningful interaction between instructors and students, students and teaching assistants, students and students, and students and the course content (Dabbagh & Schmitt, 1998; McGreal, 1998; Morss, 1999). These interactive tools, which may include the discussion board, chat room, grade book, email system, organized pages, assessment tools, student homepages, progress tracking, assignment drop box, presentation tool, and many other features that promote active learning. These tools are beneficial for instructors in their attempts to facilitate effective interaction activities in learner-centered virtual distance education classrooms (Bonk & Cummings, 1998; Knowlton, 2000; Oliver, 2000).

Interaction: A Critical Factor in Online Distance Education

Kearsley, Lynch, and Wizer (1995) and many other researchers agreed that interaction is the fundamental element that facilitates learning in distance education (Alexander & Murphy, 1998; Bonk & Cummings, 1998; Dabbagh & Schmitt, 1998; Draves, 2000; Knowlton, 2000; Lynch, 2002; McGreal, 1998; McCombs & Whisler, 1997; Morss, 1999; Oliver, 2000; Ruberg, Moore & Taylor, 1996). Zhao, Lei, Yan, Lai, and Tan (2005) indicated that interaction is the key component in effective distance education. Human interaction with technology is the most beneficial for student learning; therefore, it is crucial for online educators to develop a learning environment that promotes student-instructor, student-content, and student-student interactions (Anderson & Garrison, 1997; Garrison & Cleveland-Innes, 2005; Moore, 1989) and facilitates active learning.

Miller, King, and Doerfert (1996) emphasized that students desire personal contact with their instructors and peers, along with a high-quality level of technology in the distance education environment. New techniques must be constructed that make time for students to

interact, because personal interaction between teachers and students, students and students, and students and course content directly relates to student course satisfaction.

Stravredes (2002) emphasized the importance of interaction by affirming that student achievement and positive attitudes increased as the level of interaction increased. One important note, though, was that the quality of interaction was more significantly related to student interaction than the amount of interaction was in general. Feedback for students was one significant example; students would rather receive quality, constructive feedback concerning their work rather than a simple "good job" or "great," comments that offered no suggestions for improvement. Students needed more detailed feedback from the instructor regarding their grades in the class, which areas they excelled in, and which areas they needed to improve in.

Gao (2001) investigated the effects of different levels of interaction on achievement and attitudes of college students in a web-based learning environment. The results of the study showed that active learning on the part of students directly contributes to their learning outcomes. Gao declared that providing feedback helps reinforce the learning material and provides further motivation for students to become even more active in the learning process.

LaPointe and Gunawardena (2004) conducted a research study to understand the relationship between peer interaction and learning outcomes in computer-mediated conferencing during the spring and summer of 2002. There were 228 student participants who were enrolled in 30 online courses taught by 22 instructors at six universities in the United States, and one in Canada. Among these participants, 19 % were male and 78 % were female.

These online courses LaPointe and Gunawardena studied were very diverse; courses ranged from teaching basic skills to teaching theories, and covered many levels of education. Courses for associate degrees, bachelor degrees, master degrees, and PhDs were all incorporated into the research, all of which were designed using asynchronous online discussions. The final research results indicated that peer interaction had a strong direct effect on learning outcomes.

Holmberg (1998) indicated that the foundation of teaching is deeply rooted in interaction, and stressed that an increase in interaction between students and instructors, students and students, and students and course content can encourage student motivation and help them take pleasure in learning. Therefore, interaction again proves to be an invaluable component of the learning process.

Limits on Interaction: Challenges to the Success of Online Distance Education

Although the Internet provides opportunities for better interaction to occur, the current interaction via the Internet is not necessarily quality interaction. There are several situations involving asynchronous learning that need adjustments on behalf of teachers and students in order for truly successful interactions to occur. Ko and Rossen (2001) observed that quiet students attending class in an online environment can present problems because they often do not contribute to the online class environment and have a difficult time engaging in learning activities. Another type of student who poses specific challenges to online instructors is the disruptive student, who may aim to contradict the instructor, distracting their fellow classmates from learning. Ruberg, Moore and Taylor (1996) believed that these difficult types of students must change and choose to engage in interaction by responding to their instructors and peers either through the discussion board or chat activities.

Olson and Wisher (2002) observed that many students lack high-speed computers and Internet connections, exposing a major technical issue that impacts the ability to respond promptly during interaction. Students with slow Internet connection speeds experienced difficulties while downloading graphic files and multimedia course materials. In addition, disadvantages lie in the instructor's ability to provide immediate assistance and feedback when students experience difficulties with learning the course contents (Porter, 1997). Ko and Rossen (2001) also noted that if the class size is too small, engaging students in interaction is more difficult.

Fishman (1999) conducted a study on how frequently students utilized different communication tools such as usernet news, email, and a notebook in which students collaborated with each other. He found those students' prior experiences with computers, academic self-worth, technical computer skills, and writing and communication abilities all may have an important impact on interaction in the virtual classroom. Therefore, all these factors create more challenges for both instructors and students while communicating through an online environment.

Because instructors and students never meet physically, the lack of face-to-face interaction is the main complaint from students about online distance education. Galusha (1997) discovered that the elimination of face-to-face meetings in distance education reduced student motivation to learn the course material. However, Fleming (1998), in research conducted at Temple University, found that online teaching without face-to-face contact can indeed be successful. Educators should then encourage the use of written communication by using various active tools within distance education courses to promote students' creative and

critical thinking skills and encourage students to interact with their peers via acts of written speech.

Looking Ahead: Strategies and Recommendations for Improving Online Education

Draves (2000) stated that interaction is the heart and soul of the online course; because interactive activities make the online course come alive, this dynamic quality excites learners to participate. These online courses can bring people all over the world together to discuss course content at the same time, producing an incredible interactive online learning experience.

Therefore, it is important to create a high-quality interactive distance education learning environment for online students. To reach this goal, having a qualified educator who has the ability and knowledge to design effective materials that allow learners to partake in an enriched interactive learning experience is essential (Porter, 1997).

According to Lynch (2002), online instructors should emphasize planning while designing web-based courses. All course material students come in contact with should be well-developed and organized in one accessible location. This level of organization can increase student satisfaction with the course content. Also, course contents that include audio, video, graphics, and texts should be adapted to accommodate different learning styles. Online learning communities that encourage students to share their personal information and viewpoints also foster a strong unbound learning community that motivates students to interact with each other. Furthermore, educators can design projects that require students to do research and post their results on the discussion board, encouraging students to provide their own viewpoints in evaluating each other's projects. This type of interaction is critical to student success because it allows students to communicate by writing their own thoughts and

responding to their peers' comments. Participation also can be encouraged by developing cooperative group projects that can increase student to student interaction, reducing isolation in the online environment.

Hill and Raven (2000) conducted research that evaluated the best strategies and techniques to promote student learning and foster community building in the online environment. The results suggested four strategies. The first strategy focuses on providing a safe online environment that is readily accepted by the learners as a platform that provides clear and concise communication. The second strategy deals with course organization and helping learners establish patterns, set standards for achievement, look forward to certain types of communication, and handle information overload. The third strategy seeks to motivate learners and encourage students to keep in touch with others involved in the course. The fourth strategy is to make full use of the course technology by providing flexibility in facilitating interaction, keeping technical glitches to a minimum, and giving students multiple ways to learn.

Du, Havard and Li (2005) performed research in online discussion, focusing on task-orientated interaction for deep learning. The study was conducted over two semesters in a graduate level course, with one of the course projects concentrating on using multimedia technology. Three stages of framework were adapted in this assignment to facilitate deep learning: (1) After students completed the first two stages of framework through the first two assignments, students participated in discussion regarding the technical and theoretical aspects of multimedia on the discussion board. Students had a strong surface-level understanding of the multimedia development tools that were introduced in the class. (2) The instructor posted three questions on the discussion board designed to help students

respond to and critique each other's opinions. This discussion technique provided students with an opportunity to demonstrate their strong surface-level understanding of the instructional design principles for multimedia development. (3) Students adapted the techniques they learned in the class to produce their final comprehensive project. Du and Havard indicated that through active interaction, learning was transferred from surface to deep stages. As a result, they suggested for instructors to create dynamic discussion assignments that can encourage students to interact with the course content, share their ideas and thoughts with their peers, develop deep understanding of the content, and promote effective interaction in the online environment.

Curtis (2004) conducted research that analyzed students' conversations in chat room discussion groups. The results suggested that the asynchronous supplements of threaded discussion and synchronous chat sessions can take the place of small group activities typically held in the traditional face-to-face class setting. These discussion groups can help students construct their own knowledge and foster student-content and student-student social interactions.

Webb, Jones, Barker and Schaik (2004) conducted research in the School of Computing and Mathematics at the University of Teesside. The results indicated significant relationships between students' participation levels in discussion board activities and their learning outcomes. Rich discussion topics and well-planned activities helped students interact and gain knowledge.

Gibson (1994) indicated that online educators must present class goals and expectations clearly to promote interaction among students. Conrad (2002) and others found that learners want to understand what will be expected of them for the entire semester during

the first week of class (Garrison & Brook, 1992; Oddy, 1992). Moore (1994) believed "Learner autonomy should be a goal of distance education" (p.3), while McCombs and Whisler (1997) emphasized that instructors should cater to the needs of students to make their classroom learner-centered. To reach this goal, Scagnoli (2001) stated that universities should facilitate orientation activities for all distance education students. Online course orientation sessions serve a similar purpose as orientation for freshmen in college. These sessions help students make successful transitions, whether the student is beginning a new part of their life or just taking a class in an environment they have never experienced before. These orientation programs for online students are the primary factors in ensuring a successful start.

Online educators provide an introductory face-to-face orientation session during the first week of the semester to familiarize students with the course and its practices. Having an orientation session prior to the start date of the course is an ideal opportunity for teachers to interact with their students and give them clear guidelines for the rest of the semester. Instructors can use the orientation session to introduce the instructions regarding the course management system and resolve any technical problems that arise. Once students clearly understand the course policies and how to access the course material, it is much easier for them to work independently for the remainder of the semester. In situations where it is impossible or highly difficult for the students to meet in a face-to-face setting due to distance limitations, instructors have used online orientation training instead of face-to-face orientation. This type of online orientation needs to be planned more carefully since the instructors must use technology to develop orientation materials that can clearly guide students through course policies and procedures in a step-by-step process. Scagnoli (2001)

stated that orientation can facilitate student-student interaction, student-instructor interaction, student-content interaction, increase information retention, motivate student participation, and promote a sense of online community.

Motivation also can have an impact on how effectively students learn material for a course. Goal setting can help students focus on the course tasks and motivate students to accomplish the work. Instructors can utilize the advantages of technology and strategically design their online classes to encourage student learning. By incorporating suitable technology into the online course, instructors can urge students to think critically and facilitate active learning (Salmon, 2000). Technology also should be implemented in the classroom to encourage interaction among students to help them develop positive attitudes toward technology, motivating them to use technology to communicate and collaborate in future learning endeavors.

Student Satisfaction

Course satisfaction is a critical component in improving learning achievement in the traditional classroom and the distance education environment. Many researchers have examined the factors that influence student satisfaction in distance education (Canning, 2002; Deubel, 2003; Falk, 1998; Freddolino & Sutherland, 2000; Fredericksen, Pickett, Shea, Pelz, & Swan, 2000; Morse, 2003; Nilles, 2002; Schrum & Benson, 2000; Sener & Stover, 2000; Shapley, 2000; Zhang & Fulford, 1994). Researchers suggested that student satisfaction should be assessed before any learning outcome assessments, for negative reactions could hinder students' abilities to learn. Therefore, student satisfaction, which reflects a student's attitude toward learning, should be studied and improved by all educators so that students can excel in a distance education setting (Biner, Dean & Mellinger, 1994).

Research comparing students' attitudes within traditional classrooms and distance education settings has provided valuable information for recognizing the positive and negative reactions of distance learning students. Ritchie and Newby (1989) reported that students enjoyed the instruction more in traditional classrooms than in distance education classrooms as a whole. However, the results of the study also indicated that the students' attitudes toward the distance learning courses did not affect their learning and that students who performed well in the course did not exhibit different attitudes than traditional students. In a study conducted by Barker and Beckner (1986), survey results from 40 participants in the Accelerated Learning Spanish Distance Education Project in Utah and Nevada indicated that participants were satisfied with the course content and the student-instructor and student-student interactions. In the same way, studies conducted by Barker and Beckner (1986) and Johnson (1988) showed evidence of positive attitudes toward satellite-delivered instruction in distance education. While conflicting results are presented in research focusing on student satisfaction in distance education and traditional classroom settings, in general, distance education courses that focus on learning and apply effective technology in enhancing learning processes will most likely gain a positive reaction from students.

Moore (2002) stated that social interaction prompted by the instructor and the provision of prompt feedback were linked to students' perceptions of course satisfaction. Lynch (2002) indicated four principles about instructor effectiveness that were directly related to student satisfaction. The instructors must: (1) provide positive feedback to reward students' accomplishments, (2) instill real-world skills and knowledge in students, (3) provide up-to-date grades to reinforce student learning, and (4) share students' excellent

work with others. These principles involve student-instructor, student-content, and student-student interactions.

Fulford and Zhang (1993) studied the effectiveness of the Hawaiian Interactive Television System training course, finding that overall course interaction is a predictor of satisfaction. In a survey that studied course satisfaction from 1,406 participants enrolled in the SUNY Learning Network online courses, Shea and others (Shea, Fredericksen, Pickett, Pelz, & Swan, 2001) reported that there was a significant relationship between interaction and course satisfaction. The most significant contributor to perceived learning in these online courses was the interaction between the instructor and the students. Students reported that the higher the level of interaction with the instructor or their classmates, the higher the level of learning they achieved in the course. Out of all these participants, 94% reported that they learned as much or more as they would in a traditional course, while 70% of participants said they would like to take more online courses in the future.

Shapley (2000) shared her experience teaching Chemistry 331, an upper-level organic chemistry course at the University of Illinois at Urbana-Champaign. She indicated that increased student-instructor and student-student interactions can promote active learning and enhance critical thinking skills. She reported that student performances on tests were as good as or better in the online course environment than in traditional courses she taught. Students also were satisfied with the flexibility of the online course and the amount of learning they achieved.

Gunawardena and Zittle (1997) conducted a study in the fall of 1993 to measure how social presence predicted student course satisfaction. Fifty graduate students from five universities participated in the study. The learner-centered cooperative learning method was

employed in this course. Graduate students were responsible for doing research assignments, posting their reports, and taking turns moderating discussions and sharing their viewpoints for the whole group. The results of this study showed that human interaction and social presence were strong predictors of course satisfaction within a text-based computer conference. The interactivity, reflectivity, and collaboration projects enhanced student learning and promoted student course satisfaction. These findings indicated that educators must devise new ways to make an interactive learning environment so that student satisfaction with the course will increase.

There are several critical roles in encouraging student satisfaction. Studies have shown on a regular basis that students are willing to be involved in the decision-making process so they can play active roles in their learning.(Alexander & Murphy, 1998; Lambert & McCombs, 1998; Lynch, 2002; McCombs & Whisler, 1997; Notar, Wilson & Montgomery, 2005). Distance education teachers are also responsible for providing their students with tips on how to succeed in the online environment, keeping high course expectations for their students, and creating an environment where students are safe and feel comfortable experimenting with technology (Kimeldorf, 1994). Two other factors that play key roles in students' course satisfaction are accessibility and convenience. Support services, organizational factors, management, and the environment are all factors that may affect satisfaction (Biner et al., 1994; Buikema & Ward, 1999).

Lee, Bray, Carter-Wells, Glaeser, Ivers and Street (2004) conducted research to discover the meaning of community in an online master's degree program at California State University. The results indicated that students' active interaction with peers in the online community were strongly related to their course satisfaction. Discussion board social

postings, group discussion projects, and face-to-face orientation sessions were identified as direct contributors to active interaction. Jung, Choi, Lim and Leem (2002) and Shin (2003) echoed these findings.

Stein, Wanstreet, Calvin, Overtoom, and Wheaton (2005) examined the relationships between learners' perceptions of course structure, satisfaction levels with interaction, and technical expertise with course satisfaction. The study consisted of 201 participants registered in nine undergraduate or graduate courses at three universities in the Midwest United States in the fall of 2001 and spring of 2002. The results showed that course structure and interaction were the main factors that contributed to students' levels of satisfaction. Assignments that incorporated a high level of interactivity allowed students and the instructor and students and other students to interact with each other, which promoted satisfaction. In addition, the instructor's feedback and guidance directly contributed to student satisfaction, enhancing the knowledge students gained.

Wyatt (2005) surveyed 120 participants who attended both traditional and online courses at a university in the Midwest United States. The major motives for these participants to take online courses were scheduling issues, physical distance from campus, and family responsibilities. These participants indicated that online instruction was more academically demanding than traditional courses. The results indicated that students interacted with their instructor and their peers as much as they typically did in a traditional classroom. To improve the frequency and quality of interaction to increase student satisfaction, educators should design the course environment strategically and be willing to make alterations.

Summary

The equipment and materials required to provide Internet learning opportunities with adequate features to promote interaction are accessible to teachers because the goals of distance education are compatible with these improvements in technology. With the advancement of the Internet, educators have an unmatched opportunity to design and conduct effective distance learning courses filled with helpful features that promote interaction. Such courses could not exist without the interaction that supports them. However, dangers accompany these promises made by ever-improving technology. Educators must understand that utilizing these advanced technologies will not automatically transform their distance learning courses to be more dynamic and interactive. In fact, more hard work is required on the instructor's part to effectively adapt the technologies to develop clear, interactive online courses.

Within the advancements of education, the role of interaction has changed considerably along with the development of pedagogical approaches and methodologies. Even though the degree of interaction varies between traditional and distance settings, research about the implications of interaction on student learning has identified that interaction positively affects students' abilities to learn. Conversely, lack of interaction makes learning boring and difficult. Therefore, further research focusing on the specific implications of interaction on student learning should increase understanding on how to integrate interaction most effectively in distance education settings to maximize students' abilities to learn. Because WebCT is one of the most prominent resources utilized by distance education, it is important to examine the effectiveness of WebCT features on the incorporation of interaction in distance education, the impact of interaction on student

learning, and students' attitudes about learning within the learner-centered paradigm. Furthermore, studies focusing on innovative uses of technology that promote interaction in distance learning would be especially beneficial to teachers. These types of specialized studies expand teachers' knowledge about the different types of interaction that can occur within the online setting. Because interaction has been defined as a crucial component of the learning process, educators must familiarize themselves with interaction's impact on the quality of learning, experiment with various approaches to interaction, conduct research exploring the effectiveness of these different types of interaction, and eventually implement their findings into distance education courses so students can reap the benefits of this knowledge. With online learning as the trend for future education, much further research is needed to define the role of interaction within the online setting and determine how interaction through innovative design and advanced technology can be transferred from traditional classrooms into the online learning environment. Further research could potentially allow all students to have access to information-rich, dynamic environments that promote learning by encouraging interaction with content materials, their teachers, their peers, and the world as a whole.

CHAPTER 3: METHODOLOGY

Introduction

This chapter discusses the methodology used during this study, including the research design, the development of the instrument and the pilot test, the participants' characteristics, the sampling procedure, and the data collection and analysis techniques.

The purpose of this study was to investigate the relationships between student-instructor interaction and course satisfaction, student-TA interaction and course satisfaction, student-content interaction and course satisfaction, and student-student interaction and course satisfaction. In addition, this study was conducted to examine the relationships between students' perceptions about the effectiveness of WebCT features for their learning and their course satisfaction, and the relationships between course satisfaction and specific student attributes such as gender, academic classification, and prior distance education course experience. Many researchers suggest that interaction is an essential element in distance education (Zhao et al., 2005; Jones & Okey, 1995; Kearsley, Lynch, & Wizer, 1995; Kearsley & Shneiderman, 1998; Mayadas, 1997; Moore & Kearsley, 1996). It is critical to identify these relationships because this information will enable educators to identify, measure, and evaluate their distance education courses, assisting them in creating a successful learner-centered environment for their students.

Research Design

A survey research design was employed in this particular study, utilizing the Students' Perceived Interaction Survey (SPIS) developed by the researcher. The survey was administered to the participants through WebCT, the internet environment used for Computer Science 103, an entirely online course. The participants should not have encountered any

problems responding to the survey in WebCT because they had been exposed to this particular online environment throughout the entire semester as a Computer Science 103 student.

According to Kaye and Johnson (1999), problems arise with online surveys because participants can fill them out more than once, causing discrepancies in the results. However, to eliminate this error completely, the WebCT survey system was programmed to limit students to taking the survey only once. According to Scantron (2002), researchers need a program that allows them to collect data electronically and share those collected data in many different ways. The WebCT survey system easily facilitates the collection and deployment of data. This type of web-based survey is user-friendly (Dillman, Tortora & Bowker, 1999) and is cost-free. Each survey was completed during the week of November 29 to December 7. The participants took the survey individually using the WebCT Assessment Tool at any time they found convenient. The online distance education environment does not designate a certain time of the day for class work and accommodates 855 students; therefore, it was assumed that the student survey participants took the survey individually at whatever time they wanted. The results were individually separated, and were not reviewed until after the end of the semester. The data were saved under a password-protected WebCT account for security reasons.

Development of Instrument and Pilot Test

Computer Science 103 students enrolled at Iowa State University during the fall 2005 semester were surveyed through WebCT to determine variables related to course satisfaction. The survey was developed in four phases. In phase one, the original version of the survey was prepared, and initial pilot exploratory data were collected. The second phase was the

evaluation stage, which involved the review of the survey by an expert committee of professors. The third phase involved a pilot test: 20 Computer Science 103 Teaching Assistants took the survey, along with 46 current Computer Science 103 online students who participated voluntarily and anonymously. The survey was revised at each phase and finalized in the fourth phase.

Below is a more detailed description of what occurred in each phase of the study.

Phase One: Development of the Draft Survey

A draft of the SPIS survey was developed after consulting distance education literature and reviewing other related surveys. The objectives of the survey were kept in mind while drafting the survey questions. The survey began with a set of general instructions on how to complete the instrument.

The SPIS survey originally consisted of eight sections: Student Attitudes toward WebCT Features, Student-Teaching Assistant Interaction, Student-Instructor Interaction, Student-Student Interaction, Student-Content Interaction, Course Satisfaction, Demographic Information, and Other Suggestions About the Survey. Respondus version 3.0 was used to upload the surveys to WebCT. In addition, surveys were released and collected by WebCT version 4.1, the same version used throughout Iowa State University.

The WebCT survey function is very similar to Web surveys. According to Dillman et al. (1999), using this type of survey prevents the researcher from having to interview participants when collecting large amount of sample data. Henerson, Morris, and Fitz-Gibbon (1978) support the survey questionnaire as the most appropriate instrument for collecting a large set of data. The survey results for this study were saved within the WebCT system when the participants clicked the "submit" button after they completed all the questions. The

data file with the survey results was easily downloaded from WebCT and uploaded into the Statistical Package for the Social Sciences (SPSS), the software utilized for data analysis.

Phase Two: The Draft Survey Reviewed by Eight Experts

To verify the validity of the SPIS survey and ensure the survey provided useful data to answer the study's research questions, eight experts were contacted via email and asked to evaluate and critique the draft survey: Dr. Tom Alsbury, Assistant Professor of Education Administration and Educational Leadership and Policy Studies; Dr. Doug Bonett, Professor of Psychology and Statistics and Interim Chair of the Department of Psychology; Dr. Niki Davis, Professor of the Department of Curriculum and Instruction and the Director of the Center for Technology in Learning and Teaching; Dr. Steven Porter, Associate Professor of Educational Leadership and Policy Studies; Dr. John Schuh, Distinguished Professor of Educational Leadership and Policy Studies; Dr. Mack Shelley, Professor of the Department of Statistics and Educational Leadership and Policy Studies, and Courtesy Professor of Political Science, and the Director of the Research Institute for Studies in Education for the College of Human Sciences; Dr. Roger Smith, Associate Dean of the College of Human Sciences; and Mr. Bill Tysseling, Director of Continuing Education.

In addition to reviewing the survey via email, several of the experts were interviewed personally. According to Wiersma (1995), the survey needed to present groups of questions that accurately and thoroughly measured one specific item of research interest, such as skills, tasks, or knowledge. The experts thought the survey was valid after extensive review; however, they did provide some further suggestions for improvement.

Phase Three: The Pilot Test—Computer Science 103 TAs and Students' Reviews of the Pilot Version of the Survey

The third stage of the study involved requesting 20 Computer Science 103 Teaching Assistants and 46 Computer Science 103 students to take the SPIS survey to identify any vague questions. Both the TAs and the students were encouraged to write down their opinions about the survey and suggestions for improvement in the designated Other Suggestions About the Survey section.

After the TAs gave their suggestions, a pilot study was conducted. According to Wiersma (1995), the pilot study is meant to serve as a mechanism that identifies unclear questions, potentially confusing elements, and items in need of more thought and preparation. In addition, Glesne and Peshkin (1992) suggested that the use of a pilot study reduces the apprehension of presenting a proposal, as it directs the researcher toward the area of concentration more clearly. Therefore, it is important to carry out a small-scale study before conducting the main one to check the feasibility of the data collection methods.

Forty-six current online students took the SPIS pilot test survey (see Appendix B) voluntarily and anonymously through WebCT after receiving cover letters asking for their participation. The 46-case pilot dataset was analyzed using SPSS, where factor analysis and reliability (Cronbach's alpha) were conducted for the following measures: Student-TA Interaction, Student-Instructor Interaction, Student-Student Interaction, Student-Content Interaction, and Course Satisfaction. The factor analysis was run to determine the number of dimensions in each measure and to select items to be included on a measure. Some measures were expected to have multiple dimensions. For example, dimensions within course satisfaction included peer-based satisfaction, flexibility, and content effectiveness. Some parts of the survey—Demographic Information and Other Suggestions About the Survey—

were not analyzed using SPSS. The responses to these questions were considered and implemented in the revision of the survey by the researcher. The Student Attitudes Toward WebCT Features section was used to measure WebCT's ability to facilitate student learning. The mean response pertaining to WebCT features from each respondent was calculated, and this mean served as an input into the regression model. Therefore, running the factor analysis and reliability tests for this section was unnecessary. In the survey used for the pilot test, some questions were relevant only if the survey was to be taken at the end of the semester. Because the pilot test was conducted during the semester, some of the questions were not applicable to the students and TAs that took the survey. A few other questions were found to be vague. Those questions were eliminated during the analysis of the pilot data to obtain meaningful factor analysis results. Prior to the analyses, question 65 was reverse-coded to align with other questions in the same construct. Detailed results and questions used in each factor analysis are displayed in the Tables 3.1 and 3.2.

1. For student-TA interaction, examined in questions 18-22, one factor was determined: student-TA interaction (Cronbach's alpha = 0.833).

2. For student-instructor interaction, examined in questions 26-28, 31-33, and 35, two factors were determined: conductivity (Cronbach's alpha = 0.824) and responsiveness (Cronbach's alpha = 0.705).

3. For student-student interaction, examined in questions 37, 39, 40, 43, and 45, two factors were determined: student community effectiveness (Cronbach's alpha = 0.689) and asynchronous effectiveness (Cronbach's alpha = 0.483).

4. For student-content interaction, examined in questions 46-49, content intensity factor (Cronbach's alpha = 0.652) and quality of visual aid factor (question 49) were determined.

5. For course satisfaction, examined in questions 51, 53, 54, 58, 61, 64, 65, 76, and 83, three factors were determined: peer-based satisfaction (Cronbach's alpha = 0.731), schedulability (Cronbach's alpha = 0.698), and content effectiveness (Cronbach's alpha = 0.711).

However, these results were based on a small sample size. In general, the Kaiser-Meyer-Olkin (KMO) values from the factor analyses were low, indicating the factors were not well defined, probably due to the small sample size; if the same analysis was run on a different dataset, different factors could potentially result.

The above results indicated that some measures had more than one dimension. These multiple dimensions allowed the researcher to investigate how different aspects of certain measures correlate with the levels of student satisfaction.

Table 3.1 Factor Analysis for Pilot Version of Survey

				Factor Analysis				
Part	**Variable**	**# Items**	**Items (Questions)**	**KMO**	**# factors**	**Factor 1**	**Factor 2**	**Factor 3**
1	**WebCT Features**		(NA; only need correlation with part 6)					
2	**Student/TA**	5	18-22	0.746	1			
3	**Student/Instructor**	7	26-28, 31-33, 35	0.699	2	31, 32, 33, 35	26, 27, 28	
4	**Student/Student**	5	37,39,40, 43,45	0.562	2	37, 43, 45	39, 40	
5	**Student/Content**	4	46-49	0.472	2	46, 47, 48	49	
6	**Course Satisfaction**	9	51, 53, 54, 58, 61, 64, 65, 76, 83	0.585	3	64, 83, 65	58, 51, 61	53, 76, 54

Table 3.2 Reliability for Pilot Version of Survey

Part	Variable	# Items	Items (Questions)	Reliability (Cronbach's Alpha) Overall	Factor 1	Factor 2	Factor 3
1	**WebCT Features**		(NA; only need correlation with part 6)				
2	**Student/TA**	5	18-22	0.833			
3	**Student/Instructor**	7	26-28, 31-33, 35	0.774	0.824	0.705	
4	**Student/Student**	5	37, 39, 40, 43, 45	0.65	0.689	0.483	
5	**Student/Content**	4	46-49	0.58	0.652		
6	**Course Satisfaction**	9	51, 53, 54, 58, 61, 64, 65, 76, 83	0.792	0.731	0.698	0.711

Phase Four: Development of the Final Survey

The final survey was developed by implementing suggestions from the 20 Computer Science 103 TAs, 46 students, and 8 experts who reviewed the draft survey. To increase the response rate, the survey was shortened, focusing on simple and clear questions. Also, considerable effort was made to eliminate ambiguous questions. After the suggestions were applied, there were 7 parts in the final survey:

1) Part One: The Student Attitude Toward WebCT Features section (questions 1-9). This series of 9 questions measured the student's attitude toward WebCT features.

2) Part Two: The Student-TA Interaction section (questions 10-13). This series of 4 questions measured the frequency of student-TA interaction.

3) Part Three: The Student-Instructor Interaction section (questions 14-24). This series of 11 questions measured the frequency of student-instructor interaction.

4) Part Four: The Student-Student Interaction section (questions 25-31). This series of 7 questions measured the frequency of student-student interaction.

5) Part Five: The Student-Content Interaction section (questions 42-45 and 47). This series of 5 questions measured the frequency of student-content interaction.

6) Part Six: The Course Satisfaction section (questions 38-41, 46, and 48). This series of 7 questions measured how satisfied students were with the course.

7) Part Seven: Demographic questions (questions 49-66). Seventeen demographic questions about the participants were included in this portion of the survey (see Appendix C: The Final Survey).

Participant Characteristics and Sampling Procedures

Computer Science 103 at Iowa State University is a one-semester on-line computer literacy and applications course. In the fall of 2005, 949 students were enrolled in the class, while 25 teaching assistants were employed to help grade student homework. The participants of this study consisted of Computer Science 103 students who volunteered while taking the course during the fall of 2005. The participants were freshmen, sophomores, juniors, and seniors with various majors in the Colleges of Agriculture, Business, Design, Human Sciences, Engineering, Liberal Arts and Sciences, or Veterinary Medicine, or were undecided. Different ethnicities were also reflected in the group of participants: American Indian or Alaskan Native, Asian, Black/African-American, Hispanic, Latino, Multiethnic, Native Hawaiian/Pacific Islander, White, or Other all were surveyed for the study. The study was approved by the Human Subjects Review Committee at Iowa State University (see

Appendix A). After approval, a cover letter was sent through WebCT email that explained the details of the study to students, and informed them their participation was completely voluntary. Each survey was completed during the week of November 29 to December 7. The participants took the survey individually using the WebCT Assessment Tool at any time they found convenient. The online distance education environment does not designate a certain time of the day for class work and accommodates 855 students; therefore, it was assumed that the student survey participants took the survey individually at whatever time they wanted. The results were individually separated. A reminder was sent through WebCT email four days after the cover letter was sent.

Data Collection and Data Analysis

The survey results were analyzed using SPSS 14.0 for Windows. To analyze the demographic variables, including gender, age, college classification, ethnicity, and prior distance education experience, descriptive statistics were used. Factor analysis was used to examine the validity of the research instrument.

The factor analysis method was used to reduce a large amount of variables to a smaller amount based on the correlations between the variables. According to Tinsley and Tinsley (1987), the maximum amount of variance in the inter-item correlation matrix can be explained by the smallest number of variables. After running the factor analysis, some of the unrelated questions were removed because they were found to be vague and non-informative.

The Univariate General Linear Model Procedure and Linear Regression Procedure in SPSS were used to perform a multiple regression analysis to determine the relationship between the independent variables and course satisfaction. Descriptive statistics were

calculated for each of the demographic variables: age, gender, race, college classification, and prior distance education experiences.

According to Hinkle, Wiersma, and Jurs (1998), multiple regression analysis assumes that the scores in the population are normally distributed and the variances among the populations being compared are equal. Levene's test for Equality of Error Variances was used to examine the equal variance assumption.

This chapter described the methodology of this study. Evaluations and in-depth explorations of these analyses are presented in Chapter 4.

CHAPTER 4: DATA ANALYSIS AND RESEARCH RESULTS

This chapter contains the data analysis and the interpretation of the research results. This research investigated if there were positive relationships between student-instructor interaction and course satisfaction, student-TA interaction and course satisfaction, student-content interaction and course satisfaction, and student-student interaction and course satisfaction. The relationships between students' perceptions about the effectiveness of certain WebCT features affecting students' learning and students' levels of course satisfaction were also studied. The relationships between course satisfaction and gender, classification, and prior distance education course experiences were examined, and the validity and reliability of the constructed variables were analyzed and presented. Student demographics were analyzed, and data analysis results were addressed to answer the research question and hypotheses.

Factor analysis was one of the primary statistical methods used in this research. By using the principal component method, individual factors were extracted from each of the scales. Kaiser's rule and Scree plots were used to determine the number of factors. Both of these methods were employed because Kaiser's rule does not always give accurate results (Tabachnick & Fidell, 2001). Kaiser's rule extracts factors with eigenvalues over 1.0. The Scree plot of the eigenvalues suggests keeping all factors with eigenvalues on the steep slope before they start to level off. The latter criterion gives accurate results more frequently than the eigenvalue-greater-than-1 criterion (Green & Salkind, 2005). To justify the factor analysis results, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was examined. A KMO value greater than 0.8 indicates that the factors are well defined (Tabachnick & Fidell, 2001). If another sample was obtained and the analysis repeated, the

resulting factors would be consistently the same. Bartlett's Test of Sphericity tests the null hypothesis that the interitem correlations are zero (Tabachnick & Fidell, 2001). However, this test is known to be very sensitive, so results of this test are not emphasized. Moreover, any variable with communality less than 0.1 was removed, indicating that less than 10% of the variability in that measure was explained by all the factors. The resulting factors were correlated after the rotation. The percentage of variance score in the extraction sums of squared loadings demonstrates the amount of overall variability explained by each factor (Tabachnick & Fidell, 2001). Only one factor was extracted in each factor analysis. Therefore, varimax rotation was not necessary. The matrix of factor loadings was examined to find out the most heavily loaded factor for each question. When the maximum score for the factor loadings was smaller than 0.4, the question was eliminated.

To access internal consistency, the Cronbach's alpha statistic, based on standardized item scores for a set of unidimensional items, was calculated. A Cronbach's alpha value greater than 0.7 indicates strong internal consistency of a construct (Cronbach, 1951). A Cronbach's alpha value is also an estimate of how consistently individual people respond to the items within a scale.

Validity and Reliability of the Instrument

To examine the validity and reliability of the Students' Perceived Interaction Survey (SPIS) instrument for distance education, factor analysis and Cronbach's alpha tests were conducted.

Factor Analysis and Reliability Standards for each Survey Section

The factor analysis and reliability standards employed in this section will be explained. The survey consisted of 7 parts:

Part One: The Student Attitude toward WebCT Features section (questions 1-9) consisted of 9 questions that measured students' attitudes toward WebCT features. Questions 1-7 and 9 required students to respond on a 6-point Likert range from "A" (Strongly Agree) to "F" (Strongly Disagree) about their attitudes toward WebCT features. The data were recoded in SPSS as "A" ="6," "B" = "5," "C" = "4," "D" = "3," "E" = "2," and "F" = "1." Question 8 required students to rate their opinions on a 7-point Likert range from "A" (Strongly Agree) to "G" (Not Applicable). Again, the data were recoded in SPSS as "A" = "6," "B" = "5," "C" = "4," "D" = "3," "E" = "2," "F" = "1," and G = Missing Value (see Appendix C: The Final SPIS Instrument).

The Student Attitudes Toward WebCT Features section was used to define the effectiveness of WebCT in facilitating student learning. The mean response about WebCT features from each respondent was calculated, and this mean served as an input into the regression model, with each question measuring a different WebCT feature. Therefore, it was not necessary to run the factor analysis and reliability tests for this section.

Part Two: The Student and TA Interaction section (questions 10-13) consisted of 4 questions that measured the frequency of student-TA interaction. Students used the same 6-point range employed for questions 1-6. Questions 10-13 required students to respond on a 6-point Likert range from "A" (Strongly Agree) to "F" (Strongly Disagree) their attitudes toward student-TA interaction. The data were recoded as "A" = "6," "B" = "5," "C" = "4," "D" = "3," "E" = "2," and "F" = "1."

As shown in Table 4.1, the communality from the principal component analysis for question 13 was 0.265. This was relatively lower than the others, which indicated that the

factor explained only a relatively small amount of variability in question 13 compared to other questions. Therefore, question 13 was eliminated (see Table 4.1 for the communalities).

Table 4.1 Original Communalities for Student-TA Interaction Factor

Question	Extraction
Question 10	0.681
Question 11	0.555
Question 12	0.779
Question 13	0.265 *

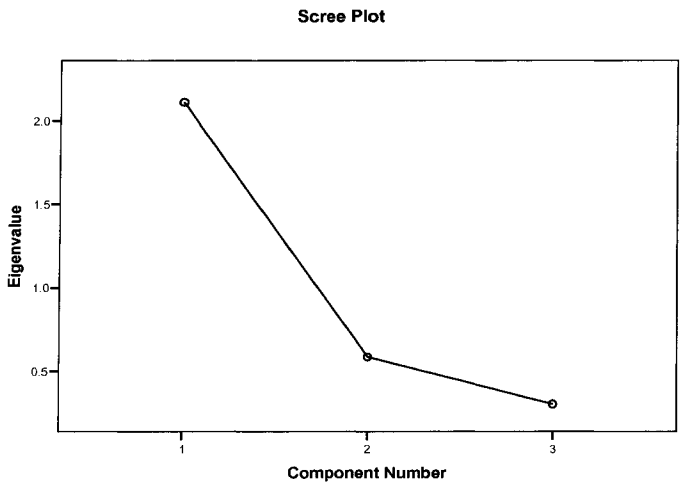
* Indicates that the question was removed.

After removing question 13, communalities for each question were higher (see Table 4.2), indicating that the new factor for questions 10-12 explained higher percentages for each question than originally calculated. The new KMO value was 0.656, indicating the factors were better defined. If another sample was obtained and the analysis repeated, the resulting factors would be consistently the same. The reliability of this portion of the SPIS survey using Cronbach's standardized alpha was 0.787, which, according to Cronbach (1951), is sufficient evidence to use the variable. The percentage of variance in the extraction sums of squared loadings was 70.384, indicating that the new factor explained 70.4% of the overall variability of questions 10-12. As evidenced in the Scree Plot shown in Figure 4.1, this test suggested only one factor.

Table 4.2 Revised Communalities for Student-TA Interaction Factor

Question	Extraction
Question 10	0.723
Question 11	0.589
Question 12	0.800

Figure 4.1 Scree Plot for Student-TA Interaction Factor



The principal component extraction method was used to determine the factors in this study. In Table 4.3, the component matrix shows the factor loadings for each question within the student-TA section. It indicates the correlation between each question and the factor. If a question's factor loading score was smaller than 0.4, that question was not correlated with other questions within the section and should be removed. According to the component matrix table, questions 10-12 were highly correlated. Only one component was extracted; therefore, rotation was not necessary.

Table 4.3 Component Matrix for Student-TA Interaction Factor

Question	Component 1
Question 10	0.850
Question 11	0.767
Question 12	0.894

Part Three: The Student and Instructor Interaction section (questions 14-24) consisted of a series of 11 questions that measured the frequency of student-instructor interaction. For

questions 15-18 and 20-23, students rated their responses on a 6-point Likert scale from "A" (Strongly Agree) to "F" (Strongly Disagree) that measured the frequency of student and instructor interaction. The data were recoded in SPSS as "A" = "6," "B" = "5," "C" = "4," "D" = "3," "E" = "2," and "F" = "1." Questions 14 and 19 required students to rate their opinions on a 7-point Likert scale from "A" (Strongly Agree) to "G" (Not Applicable). The data were recoded in SPSS as "A" = "6," "B" = "5," "C" = "4," "D" = "3," "E" = "2," "F" = "1," and "G" = Missing Value. Question 24 required students to answer how many essay questions they completed throughout the entire semester. The scale for this question was different than the scale used for the previous questions. The scale ranged from 0-41 and greater. (see Appendix C: The Final SPIS Instrument)

In Table 4.4, the Communalities, or Principal Component Analysis Extraction scores for questions 14, 19, 20, and 24 were 0.014, 0.013, 0.117, and 0.083, respectively. These scores were relatively lower than the others. Therefore, questions 14, 19, 20, and 24 were eliminated.

As Table 4.5 shows, after removing questions 14, 19, 20, and 24, the analysis was run again and the communality scores for most of the remaining questions were higher. This change indicated that the new factor contained in questions 15-18 and 21-23 explained higher percentages of variance than before. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was 0.836, which was greater than 0.8. This score indicated that the factors were well defined, and, if another sample was obtained and the analysis repeated, the resulting factors would be consistently the same. The Cronbach's Alpha Based on Standardized Items score indicated the reliability score was 0.765, which was higher than 0.7. This score showed the presence of sufficient evidence to study the variable's

differences. The percentage of variance score from the extraction sums of squared loadings test was 42.093. This score indicated that the new factor could explain 42.1% of the overall variability in questions 15-18 and 21-23. The Scree Plot suggested only one factor. (see Figure 4.2)

Table 4.4 Original Communalities for Student-Instructor Interaction Factor

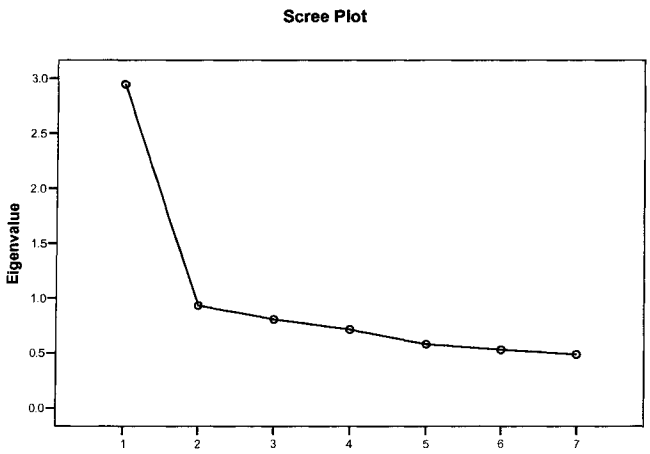
Question	Extraction
Question 14	0.014 *
Question 15	0.275
Question 16	0.492
Question 17	0.563
Question 18	0.291
Question 19	0.013 *
Question 20	0.117 *
Question 21	0.426
Question 22	0.405
Question 23	0.424
Question 24	0.083 *

* Indicates that the question was removed.

Table 4.5 Revised Communalities for Student-Instructor Interaction Factor

Question	Extraction
Question 15	0.280
Question 16	0.520
Question 17	0.591
Question 18	0.275
Question 21	0.428
Question 22	0.416
Question 23	0.437

Figure 4.2 Scree Plot For Student-Instructor Interaction Factor



The principal component method was used to determine the major factor in this study using the statistic method known as factor analysis. In Table 4.6, the component matrix shows the factor loadings for each question within the student-instructor section. It indicates the correlation between each question and the factor. If a question's factor loading score was smaller than 0.4, the question was not correlated with other questions within the section. Therefore, the question should be removed. According to component matrix table, questions 15-18 and 21-23 were highly correlated. Only one component was extracted; therefore, rotation was unnecessary.

Table 4.6 Component Matrix for Student-Instructor Factor

Question	Component 1
Question 15	0.529
Question 16	0.721
Question 17	0.769
Question 18	0.524
Question 21	0.654
Question 22	0.645
Question 23	0.661

Part Four: The Student to Student Interaction section (questions 25-31) consisted of a series of 7 questions that measured the frequency of student-student interaction. In questions 25-29, students rated their responses on a 6- point Likert scale from "A" (Strongly Agree) to "F" (Strongly Disagree) that measured the frequency of student and student interaction. The data were recoded in SPSS as "A" = "6," "B" = "5," "C" = "4," "D" = "3," "E" = "2," and "F" = "1." Question 30 measured how many total comments the students posted on the discussion board when they evaluated other students' projects. Question 31 measured how many total comments the student received from other students regarding their projects in the Computer Science 103 class. The scale for these two questions was different than the scale used for the previous questions. The scale ranged from 0-100 or above. (see Appendix C: The Final SPIS Instrument)

As shown in Table 4.7, the Communalities, or Principal Component Analysis Extraction scores for questions 30 and 31 were 0.106 and 0.077, respectively. These scores were relatively lower than the others. Therefore, questions 30 and 31 were eliminated.

After removing questions 30 and 31, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was 0.736, close to 0.8. This score indicated the factors were fairly well defined. If another sample was obtained and the analysis repeated, the resulting factors would be consistently the same. The reliability based on Cronbach's Alpha Based on Standardized Items score was calculated as 0.685, close to 0.7. This score indicated the presence of sufficient evidence to study the variable's differences. The percentage of variance score from the extraction sums of squared loadings was 44.651. This score indicated that the new factor could explain 44.7% of the overall variability of questions 25-29. The Scree Plot shown in Figure 4.3 suggested only one factor.

Table 4.7 Original Communalities for Student-Student Interaction Factor

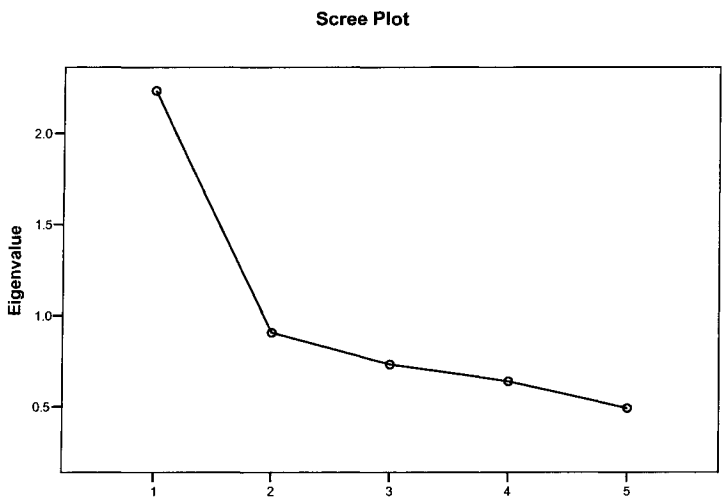
Question	Extraction
Question 25	0.530
Question 26	0.502
Question 27	0.497
Question 28	0.366
Question 29	0.248
Question 30	0.106 *
Question 31	0.077 *

* Indicates that the question was removed.

Table 4.8 Revised Communalities for Student-Student Interaction Factor

Question	Extraction
Question 25	0.561
Question 26	0.534
Question 27	0.487
Question 28	0.380
Question 29	0.270

Figure 4.3 Scree Plot for Student-Student Interaction Factor



The principal component method was used to determine the major factor in this study using the statistic method known as factor analysis. Table 4.9 shows the component matrix for the factor loadings for each question within this student-student section. This matrix indicated the correlation between each question with the factor. If a question's factor loading score was smaller than 0.4, the question was not correlated with other questions within the section. Therefore, the question was removed. According to the component matrix table, questions 25-29 were highly correlated. Only one component was extracted; therefore, rotation was unnecessary.

Table 4.9 Component Matrix for Student-Student Interaction Factor

Question	Component 1
Question 25	0.749
Question 26	0.731
Question 27	0.698
Question 28	0.617
Question 29	0.520

Part Five: The Student and Content Interaction section (questions 42-45 and 47) consisted of a series of 5 questions that measured the qualities of student and content interaction on 5 student-content items. In questions 42-45 and 47, students rated their responses on a 6-point Likert scale from "A" (Strongly Agree) - "F" (Strongly Disagree) that measured the qualities of student and content interaction. The data were recoded in SPSS as "A" = "6," "B" = "5," "C" = "4," "D" = "3," "E" = "2," and "F" = "1."

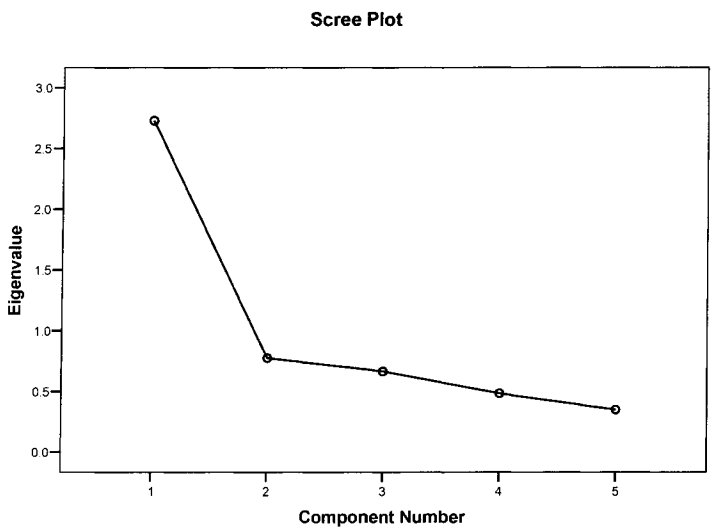
The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was 0.804, which was greater than 0.8. This score indicated that the factors were well defined, and if another sample was obtained and the analysis repeated, the resulting factors would be consistently the

same. The reliability score, based on Cronbach's Alpha Based on Standardized Items, was 0.786, higher than 0.7. This score indicated that there was sufficient evidence to study the variable's differences. The percentage of variance score from the extraction sums of squared loadings was 54.6. This score indicated that the new factor explained 54.6% of the overall variability of questions 42-45 and 47. The Scree Plot shown in Figure 4.4 suggested only one factor.

Table 4.10 Communalities for Student-Content Interaction Factor

Question	Extraction
Question 42	0.626
Question 43	0.430
Question 44	0.348
Question 45	0.720
Question 47	0.606

Figure 4.4 Scree Plot For Student-Content Interaction Factor



In Table 4.11, the component matrix shows the factor loadings for each question within the student-content section. The table indicates the correlation between each question with the factor. If a question's factor loading score was smaller than 0.4, the question was not correlated with other questions within the section. Therefore, the question was removed. According to the component matrix table, questions 42-45 and 47 were highly correlated. Only one component was extracted; therefore, rotation was unnecessary.

Table 4.11 Component Matrix for Student-Content Interaction Factor

Question	Component 1
Question 42	0.791
Question 43	0.655
Question 44	0.590
Question 45	0.849
Question 47	0.779

In addition, questions 32-37 were designed to measure the amount of student-content interaction. However, the factor analysis failed to provide KMO and the Barlett's Test of Sphericity scores. The reliability of these questions was 0.473, much lower than 0.7. Therefore, these questions were removed. Furthermore, Zhang and Fulford (1994) found no specific correlation between the time students spent completing messages online and their thoughts on how often they interacted with the course contents. Because of this research, it was appropriate to measure the qualities of student and content interaction by using questions 42-45 and 47.

Part Six: The Course Satisfaction section (questions 38-41, 46, 48) consisted of a series of 7 questions that measured student course satisfaction. Students rated their responses on a 6-point Likert scale from "A" (Strongly Agree) - "F" (Strongly Disagree). This scale

measured the degree of student satisfaction. The data were recoded in SPSS as "A" = "6," "B" = "5," "C" = "4," "D" = "3," "E" = "2," and "F" = "1."

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was 0.821, which was greater than 0.8, indicating the factors were well defined. If another sample was to be obtained and the analysis repeated, the resulting factors would be consistently the same. The reliability score of this portion of the SPIS survey using Cronbach's Alpha Based on Standardized Items was 0.833. This score was higher than 0.7, indicating there was sufficient evidence to study the variable's differences. The percentage of variance score from the extraction sums of squared loadings was 54.901. This score indicated that the new factor explained 54.9% of the overall variability of questions 38-41, 46, and 48. The Scree Plot shown in Figure 4.5 suggested only one factor.

The principal component method was used to determine the major factor in this study using the statistic method known as factor analysis. The factor in factor analysis was extracted using the principal component method. As shown in Table 4.13, the component matrix showed the factor loadings for each question within the course satisfaction section. It indicates the correlation between each question with the factor. If a question's factor loading score was smaller than 0.4, the question was not correlated with other questions within this section. Therefore, the question was removed. According to the component matrix table, questions 42-45 and 47 were highly correlated. Only one component was extracted; therefore, rotation was unnecessary.

Table 4.12 Communalities for Course Satisfaction

Question	Extraction
Question 38	0.494
Question 39	0.413
Question 40	0.492
Question 41	0.507
Question 46	0.667
Question 48	0.721

Figure 4.5 Scree Plot For Course Satisfaction

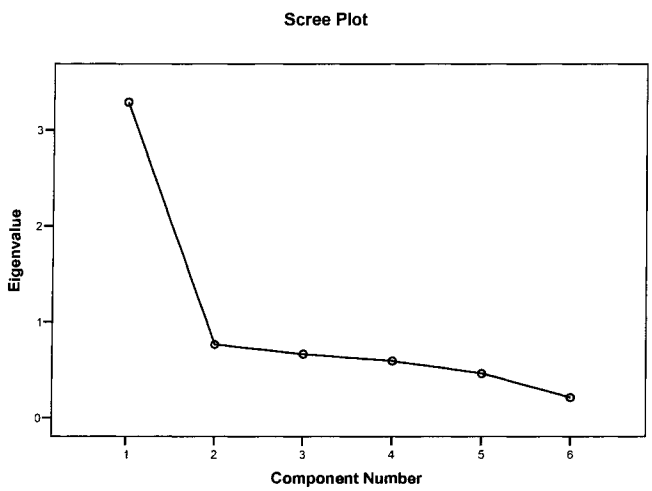


Table 4.13 Component Matrix for Course Satisfaction

Question	Component 1
Question 38	0.703
Question 39	0.642
Question 40	0.702
Question 41	0.712
Question 46	0.817
Question 48	0.849

After running the factor analyses for sections 2-6, most of the values of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) were greater than 0.8. These results indicated that the factors were well defined. If another sample was obtained and the analysis repeated, the resulting factors would be consistently the same. Most of the reliability of Cronbach's Alpha Based on Standardized Items scores for each factor were greater than 0.7. A Cronbach's alpha score greater than 0.7 indicates strong internal consistency of a construct (Cronbach, 1951). These scores indicate how consistently individuals respond to the items within a scale. Table 4.14 shows the factor analysis and Cronbach's alpha scores for 6 factors.

Table 4.14 Factor Analysis and Reliability for the Final Survey

Part	Variable	Number Items	Questions	Factor Analysis			Reliability (Cronbach's Alpha Based on Standardized) Overall
				KMO	% of Variance	# Factors	
1	**WebCT Features**	N/A	Only need correlation with part 6				
2	**Student/TA**	3	10-12	0.656	70.384	1	0.787
3	**Student/Instructor**	7	15-18, 21-23	0.836	42.093	1	0.765
4	**Student/Student**	5	25-29	0.736	44.651	1	0.685
5	**Student/Content**	5	42-45, 47	0.804	54.588	1	0.786
6	**Course Satisfaction**	6	38-41, 46, 48	0.821	54.901	1	0.833

Part Seven: Demographic Information (questions 49-66). Seventeen demographic questions about the participants were included in this portion of the survey. (see Appendix C: The Final SPIS Instrument)

In questions 49-52, students rated their responses on a 6-point Likert scale from "A" (Strongly Agree) - "F" (Strongly Disagree) that measured their learning attitudes. The data were recoded in SPSS as "A" = "6," "B" = "5," "C" = "4," "D" = "3," "E" = "2," and "F" = "1."

Question 53 surveyed the students' motivations for taking this course, and if it was required for their major. Question 54 asked whether the student preferred the web-based setting to a traditional face-to-face lecture setting. In order to complete the analysis in SPSS, a dummy variable was created for each question: "A" ("Yes") = "1," and "B" ("No") = "0."

In questions 55 and 56, students rated their responses on a 5-point Likert scale from "A" ("0") - "E" ("more than 3") that measured the number of the online courses they have taken before. The data were recoded in SPSS as "A" = "4," "B" = "3," "C" = "2," "D" = "1," and "E" = "0."

In questions 58 and 59, students were asked to respond on a 6-point Likert scale from "A" (Strongly Agree) - "F" (Strongly Disagree) that measured the speed of their Internet connection at home and if WebCT was slow when they accessed the course throughout the semester. The data were recoded in SPSS as "A" = "6," "B" = "5," "C" = "4," "D" = "3," "E" = "2," "F" = "1."

In question 60, students were asked to respond on a 6-point Likert scale from "A" ("18-25") - "F" ("61 or older") regarding their age group. The data were recoded in SPSS as "A" = "6," "B" = "5," "C" = "4," "D" = "3," "E" = "2," and "F" = "1."

In question 61, students were asked to provide their gender, "A" ("Male"), "B" ("Female"). A dummy variable was created for this question after entering into SPSS: "A" = "0," and "B" = "1."

In question 62, students were asked to respond on a 5- point Likert scale from "A" ("Below 1.76") - "E" ("3.26 or above") with their GPA. The data were recoded in SPSS as "A" = "5," "B" = "4," "C" = "3," "D" = "2," and "E" = "1."

In question 63, students were asked to respond on a 3-point Likert scale from "A" ("Full-Time") - "C" ("Unemployed") regarding their employment status while taking the class. The data were recoded in SPSS as "A" = "3," "B" = "2," "C" = "1."

In question 64, students were asked to respond on a 4-point Likert scale from "A" ("Freshman") - "D" ("Senior") with their academic status. The data were recoded in SPSS as "A" = "4," "B" = "3," "C" = "2," and "D" = "1."

In question 65, students were asked to respond on a 7-point Likert scale from "A" ("Agriculture") - "G "("Other") regarding their primary major or intended major. The data were recoded in SPSS as "A" = "6," "B" = "5," "C" = "4," "D" = "3," "E" = "2," "F" = "1," and "G" = Missing Value.

In question 66, students were asked to respond on a 7-point Likert scale with their ethnicity from "A" ("American Indian or Alaskan Native") - "H" ("Other"). The data were recoded in SPSS as "A" = "6," "B" = "5," "C" = "4," "D" = "3," "E" = "2," "F" = "1," and "G" = Missing Value. There were no factor analysis or reliability tests for the demographic information section.

Demographic Information

Out of the 949 students enrolled in Computer Science 103 for the fall semester of 2005, 46 students participated in the pilot study and 855 students voluntarily participated in the actual survey used for the study, resulting in a response rate of 94.7%. The data collected as a result of this survey are included in Table 4.15. The topics covered in the survey include gender, age group, academic status, GPA, employment status, and ethnicity. Among the respondents, 52.4% were female, while 47.5% were male. The majority of students who took Computer Science 103 were 18 to 25 years old (97.5%), while 1.4 % of students were from 26-30 years old. Students who were 31-40 years old made up 0.7% of the sample, and two students did not report their age. Sophomores outnumbered students from all other academic classes, making up 41.9% of the total sample. Freshmen followed behind with 29.1%, while juniors and seniors accounted for 19.9% and 9.0%, respectively.

Table 4.15 Demographic Data – Gender, Age Group and Academic Status

		Frequency	Percent
Gender			
	Female	448	52.4%
	Male	406	47.5%
	Missing	1	0.1%
Age Group			
	18 - 25	834	97.5%
	26 - 30	12	1.4%
	31 - 40	6	0.7%
	Missing	2	0.2%
Academic Status			
	Freshman	249	29.1%
	Sophomore	358	41.9%
	Junior	170	19.9%
	Senior	77	9.0%
	Missing	1	0.1%

In Table 4.16, as for GPA, the majority of the sample held a GPA between 2.76 and 3.25, accounting for 34.9% of the sample. The range of 3.26 or above was second with 29.6%. The rest of the students held a GPA of 2.75 or below. Only 39.9% of students were unemployed while taking the course, while the rest were involved in full or part-time work.

The majority of the sample (86.7%) was white; however, the survey did include students who were Asian, Black/African American, Hispanic, Multi-Ethnic, Native Hawaiian/Pacific Islanders, American Indian or Alaskan, or even other ethnicities not specifically listed on the survey.

Table 4.16 Demographic Data – My GPA, Employment Status and Ethnicity

		Frequency	Percent
My GPA			
	Below 1.76	8	0.9%
	1.76 - 2.25	94	11.0%
	2.26 - 2.75	199	23.3%
	2.76 - 3.25	298	34.9%
	3.26 or above	253	29.6%
	Missing	3	0.3%
Employment Status			
	Full-time	50	5.8%
	Part-time	464	54.3%
	Unemployed	341	39.9%
Ethnicity			
	American Indian or Alaskan	1	0.1%
	Asian	40	4.7%
	Black/African American	26	3.0%
	Hispanic, Latino	17	2.0%
	Multi-Ethic	6	0.7%
	Native Hawaiian/ Pacific Islander	2	0.2%
	White	741	86.7%
	Other	19	2.2%
	Missing	3	0.4%

Table 4.17 displays information about students' primary or intended majors, whether they took Computer Science 103 as a required or elective course, whether they preferred web-based course instruction to a typical face-to-face classroom setting, the number of partially online courses they had previously taken, the number of entirely online courses they had previously taken, and the amount of experience they had with WebCT. About one-third of the respondents were from the College of Business (35.2%), while 19.3% of students were from the College of Human Sciences. Students from the College of Agriculture accounted for 14.5%, 16.1% of the students were from the College of Liberal Arts and Sciences, 6.3% of the students were from the College of Design, 2.% were from the College of Engineering, 1.8% of the students were from the College of Veterinary Medicine, and 4.6% of students were still undecided. Many students (74.5%) were motivated to take the class because it was essential to fulfill requirements for their major, while 25.5% reported that the course was an elective. The majority of the students (93.2%) reported that they preferred the course taught in a Web-based format, while only 6.8% of the students thought they would prefer the course taught in a face-to-face format.

As for student experience using WebCT, 33.2% of the students reported they had used WebCT for more than 3 years before they took the class, 27.8% of the students had 1-3 years of WebCT experience, 20.1% of the students had 7-12 months of experience, 13.9% had 4-6 months of experience, and only 5.0% of students had used WebCT for just 0-3 months.

Table 4.17 Demographic Data – Colleges, Required Course, Preferred Web-Based Course and WebCT Experience

		Frequency	Percent
College where they enrolled			
	Agriculture	124	14.5%
	Business	301	35.2%
	Design	54	6.3%
	Human Sciences	165	19.3%
	Engineering	17	2.0%
	Liberal Arts &Sciences	138	16.1%
	Veterinary Medicine	15	1.8%
	Other	39	4.6%
	Missing	2	2.0%
Required Course			
	Required Course	637	74.5%
	Elective Course	218	25.5%
Preferred Web-Based Course			
	Yes	797	93.2%
	No	58	6.8%
WebCT Experience			
	0 - 3 Months	43	5.0%
	4 - 6 Months	119	13.9%
	7 - 12 Months	172	20.1%
	More then 1 year	174	20.4%
	More then 2 years	63	7.4%
	More then 3 years	284	33.2%

As shown in Table 4.18, 41.5% of the students had never taken partially online courses before they took Computer Science 103, while 39.3% of the students had previously taken 1 to 3 partially online courses. Of the survey sample, 19.2% of the students had taken more than 3 partially online courses before they took this online course.

Information about students' prior experiences taking entirely online courses indicates that 67.4% of surveyed students had never taken an entirely online course before they took this class, while the remaining 32.3% had at least one experience with an entirely online course.

Table 4.18 Demographic Data – Number of Partial Online Course Taken Before and Number of Entirely Online Course Taken Before

		Frequency	Percent
Number of Partial Online Courses Taken Before			
	0	355	41.5%
	1	183	21.4%
	2	98	11.5%
	3	55	6.4%
	More than 3	164	19.2%
Number of Entirely Online Courses Taken Before			
	0	576	67.4%
	1	185	21.6%
	2	65	7.6%
	3	15	1.8%
	More than 3	11	1.3%
	Missing	3	0.3%

As shown in Table 4.19, 27.2% of the students reported their Internet connections were slow when they attempted to access the course material. Also, 38.1% of the students indicated the WebCT server was slow when they accessed materials for this class.

In addition, this group of students appeared to somewhat reflect the student population of Iowa State University. Therefore, to interpret the results of this study accurately, readers need to compare their own institutions with Iowa State. This sample was quite large and represented 4.1% of the total Iowa State University undergrad student population. The group accurately reflects the diversity of Iowa State in gender, age, ethnicity, and majors, and closely mirrors the entire student body. Furthermore, one third of the students reported that their computer hardware, the internet, and WebCT was slow when

they accessed the course contents. The research institution's data about students' participation in distance education was not available. The data collected was related to student enrollment in courses using distance education, and WebCT may provide opportunities for future research at Iowa State University.

Table 4.19 Demographic Information – My Internet is Slow and WebCT is Slow

		Frequency	Percent
My internet is slow			
	Strongly Agree	29	3.4%
	Agree	76	8.9%
	Slightly Agree	127	14.9%
	Slightly Disagree	126	14.7%
	Disagree	329	38.5%
	Strongly Disagree	168	19.6%
WebCT is slow			
	Strongly Agree	48	5.6%
	Agree	97	11.3%
	Slightly Agree	181	21.2%
	Slightly Disagree	157	18.4%
	Disagree	272	31.8%
	Strongly Disagree	100	11.7%

Research Model and Findings

To examine the relationship between course satisfaction and other independent variables, a multiple linear regression model was developed by the researcher. The assumptions for multiple regression analysis include independence, equality of error variances, and normality of the residuals.

VIF (variance inflation factor) was used to assess multicollinearity, which exists when the independent variables correlate with each other. If a VIF value is above 10, then these values indicate serious multicollinearity, which inflates the standard errors of the regression coefficients. At a result, t-tests will not be accurate for testing deviation of the

regression coefficient from zero. This multicollinearity problem can be fixed by removing one or all of the independent variables that are highly correlated.

The most appropriate statistical method to analyze the data was regression analysis. The model used a set of continuous and categorical variables to predict course satisfaction. For the categorical independent variables, dummy variables were created. The model developed by the researcher is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 Z_1 + \beta_9 Z_{21} + \beta_{10} Z_{22} + \beta_{11} Z_{23}$$

where Y = Course satisfaction

X_1 = WebCT effectiveness

X_2 = Prior partial online experience

X_3 = Prior entirely online experience

X_4 = Student-TA interaction

X_5 = Student-instructor interaction

X_6 = Student-student interaction

X_7 = Student-content interaction

Z_1 = Gender (Male)

Z_{21} = Year (Freshman)

Z_{22} = Year (Sophomore)

Z_{23} = Year (Junior)

Examination of Overall Model

The F test (shown in table 4.21) was used to examine the overall multiple regression model. The null hypothesis is $H_0: \beta_i = 0$. The F statistic was 179.447. The p-value was < 0.001, meaning the model is significant. The R square value of 0.702 means that all the

independent variables together predict 70.2% of the variability of course satisfaction, which is fairly high.

The assumptions of this model—independence, normality, and equality of variances—were satisfied. Because the surveys were completed at a time of convenience to the individual student, rather than a classroom setting, independence can be assumed. The histogram of standardized residuals showed that the residuals closely followed a normal distribution. The result of the Levene's Test of Equality of Error Variances (Table 4.19) indicated the F value was 1.427 and the P-value was 0.191. Therefore, the null hypothesis was not rejected; the model met the equality variance assumption.

Table 4.20 Test of Between Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	One Tailed Significant
Corrected Model	285.660	11	25.969	179.447	< 0.001
Intercept	1.400	1	1.400	9.671	0.001
Gender	1.289	1	1.289	8.909	0.002
Academic Year	0.497	3	0.166	1.145	0.165
WebCT Effectiveness	2.045	1	2.045	14.133	< 0.001
Partial Online Experience	0.001	1	0.001	0.006	0.471
Entirely Online Experience	0.112	1	0.112	0.774	0.190
Student - TA	0.107	1	0.107	0.737	0.196
Student - Instructor	1.103	1	1.103	7.621	0.003
Student - Student	1.958	1	1.958	13.527	< 0.001
Student - Content	85.787	1	85.787	592.788	< 0.001

* One-tailed significant *p*-value was divided by the two-tailed *p*-value from SPSS output.
R Square = .702

Table 4.21 Levene's Test of Equality of Error Variances

Dependent Variable: Course Satisfaction

F	df1	df2	Significant
1.427	7	842	0.191

This tested the null hypothesis that the error variance of the dependent variable was equal across groups. Design: Intercept + Gender + Academic Year + WebCT Effectivess + Partial Online Experience + Entirely Online Experience + StudentTA Interaction + Student Instructor Interaction + StudentStudent Interaction + StudentContent Interaction

Table 4.22 Parameter Estimates

Parmeter	B	Std. Err	t	One-Tailed Significant	VIF
Intercept	-0.0567	0.153	-3.579	0.002	
Gender(Male =0)	0.0810	0.027	2.985	0.002	1.084
Gender(Female = 1)	0[a]	.	.	.	.
Year [Freshman = 1]	0.094	0.052	1.818	0.035	3.261
Year [Sophmore =2]	0.080	0.049	1.642	0.051	3.372
Year [Junior =3]	0.075	0.053	1.417	0.079	2.609
Year [Senior]	0[a]	.	.	.	.
WebCT Effectiveness	0.117	0.031	3.759	< 0.001	2.069
Prior Partial Online Experience	-0.001	0.010	-0.075	0.471	1.288
Prior Entirely Online Experience	0.015	0.017	0.880	0.190	1.141
Student-TA	0.017	0.020	0.858	0.196	1.491
Student-Instructor	0.105	0.038	2.761	0.003	2.205
Student-Student	0.079	0.021	3.678	< 0.001	1.466
Student-Content	0.756	0.031	24.347	< 0.001	2.107

* One-tailed significant *p*-value was divided by the two-tailed *p*-value from SPSS output.

According to Table 4.22, VIF statistics for this model were between 1.084 and 3.372. These statistics did not indicate any multicollinearity problems. Since all the assumptions for multiple regression were satisfied, this model was used to test the research question. The

individual hypotheses will be analyzed more comprehensively in the Testing the Null Hypotheses and Findings section.

Testing the Null Hypotheses and Findings

The research question of this study aimed to determine whether a positive relationship between students' perceived effectiveness of course-related interaction and their course satisfaction exists. Nine hypotheses were tested using the multiple regression model at an alpha level of 0.05 (one tailed). The multiple regression results take into account the relationships of all variables in the model simultaneously, and thus provide a more accurate measure of how any one independent variable is related to the dependent variable. The regression model estimates the partial slopes between a predictor variable and the dependent variables. This estimate differs from the bivariate correlation between these variables, which does not partial out the relationships among the other variables in the model.

First Null Hypothesis

There is no positive relationship between students' scores on the student-instructor interaction items in the SPIS instrument for distance education and their scores on the course satisfaction items in the SPIS instrument for distance education.

The mean of the student-instructor variable was 5.423. According to the results shown in Table 4.22, the regression coefficient of the student-instructor variable was estimated to be 0.105. The corresponding p-value for the t test was less than 0.003. Therefore, the null hypothesis was rejected. The results suggested that there was a positive and significant relationship between students' scores on the student-instructor interaction items in the SPIS instrument for distance education and students' scores on the course satisfaction items in the SPIS instrument for distance education.

Second Null Hypothesis

There is no positive relationship between the students' scores on the student-TA interaction items in the SPIS instrument for distance education and their scores on the course satisfaction items in the SPIS instrument for distance education.

The mean of the student-TA variable was 5.171. According to the results shown in Table 4.22, the regression coefficient of the student-TA variable was estimated to be 0.017. The corresponding *p*-value for the t test was 0.196, which was greater than 0.05. Therefore, the null hypothesis was not rejected, suggesting that there was no positive and significant relationship between the students' scores on the student-TA interaction items in the SPIS instrument for distance education and their scores on the course satisfaction items in the SPIS instrument for distance education.

Third Null Hypothesis

There is no positive relationship between the students' scores on the student-student interaction items in the SPIS instrument for distance education and their scores on the course satisfaction items in the SPIS instrument for distance education.

The mean of the student-student variable was 5.233. According to the results shown in Table 4.22, the regression coefficient of the student-student variable was estimated to be 0.079. The corresponding *p*-value was less than 0.001. Therefore the null hypothesis was rejected, suggesting that there was a positive and significant relationship between the students' scores on the student-student interaction items in the SPIS instrument for distance education and their scores on the course satisfaction items in the SPIS instrument for distance education.

Fourth Null Hypothesis

There is no positive relationship between the students' scores on the student-content interaction items in the SPIS instrument for distance education and their scores on the course satisfaction items in the SPIS instrument for distance education.

The mean of the student-content variable was 5.258. According to the results shown in Table 4.22, the regression coefficient of the student-content variable was estimated to be 0.756. The corresponding *p*-value for the t test was less than 0.001. Therefore, the null hypothesis was rejected, suggesting that there was a positive and significant relationship between the students' scores on the student-content interaction items in the SPIS instrument for distance education and their scores on the course satisfaction items in the SPIS instrument for distance education.

Fifth Null Hypothesis

The mean score for the female participants is equal to or greater than the mean score for the male participants on the course satisfaction items in the SPIS instrument for distance education.

According to the results shown in Table 4.20, the *p*-value for the t test was 0.002, which was less than 0.05. Therefore, the null hypothesis was rejected, suggesting that the mean score for the female participants was less than the mean score for the male participants on the course satisfaction items in the SPIS instrument for distance education. The mean for males was 5.263, while the mean for females was 5.164. Males were more satisfied than females with the course.

Sixth Null Hypothesis

There is no positive relationship between students' classification and their scores on the course satisfaction items in the SPIS instrument for distance education.

According to the results shown in Table 4.20, the *p*-value for the t test was 0.165, which was greater than 0.05 Therefore the null hypothesis was not rejected, suggesting that there was no positive relationship between students' classification and students' scores on the course satisfaction items in the SPIS instrument for distance education.

Seventh Null Hypothesis

There is no positive relationship between students' amount of prior distance education experience in partial online class settings and their scores on the course satisfaction items in the SPIS instrument for distance education.

According to the results shown in Table 4.22, the regression coefficient of students' amount of prior distance education experience in partial online class settings was estimated to be -0.001. The *p*-value for the t test was 0.471, which was greater than 0.05. Therefore, the null hypothesis was not rejected, suggesting that there was no positive relationship between students' prior experiences with distance education in partial online class settings and their scores on the course satisfaction items in the SPIS instrument for distance education.

Eighth Null Hypothesis

There is no positive relationship between students' amount of prior distance education experience in an entirely online class and their scores on the course satisfaction items in the SPIS instrument for distance education.

According to the results shown in Table 4-22, the regression coefficient of students' amount of prior distance education experience in an entirely online class was estimated to be 0.015. The *p*-value for the t test was 0.190, which was greater than 0.05. Therefore, the null hypothesis was not rejected, suggesting that there was no positive relationship between students' prior distance education experiences in an entirely online class and their scores on the course satisfaction items in the SPIS instrument for distance education.

Ninth Null Hypothesis

There is no positive relationship between students' scores on their perceptions of the effectiveness of the WebCT features items in the SPIS instrument for distance education and their scores on the course satisfaction items in the SPIS instrument for distance education.

The mean of the WebCT features variable was 5.055. According to the results shown in Table 4.22, the regression coefficient of students' scores on their perceptions of the effectiveness of WebCT features was estimated to be 0.117. The corresponding *p*-value was less than 0.001. Therefore, the null hypothesis was rejected, suggesting that there was a positive and significant relationship between students' scores of perceptions about the effectiveness of WebCT features items in the SPIS instrument for distance education and students' scores on course satisfaction items in the SPIS instrument for distance education.

In this chapter, the research question and the nine hypotheses were examined and the demographic information was analyzed. According to the research results, academic year, student-TA interaction, prior partial online course experience, and prior entirely online course experience did not predict course satisfaction. However, student-instructor interaction, student-student interaction, student-content interaction, WebCT features, and gender were predictors of students' course satisfaction.

CHAPTER 5: DISCUSSION AND CONCLUSIONS

This chapter reviews the purpose of the study, research questions, hypotheses, research procedures, and the analysis of the data. Also included are summarizations of the research findings and discussions of the results, the limitations of the study, the conclusions and recommendations, and suggestions for future research.

The purpose of this study was to determine whether there were relationships between how effective students thought course-related interaction was and their course satisfaction within the learner-centered paradigm in distance education. These variables were measured by the Students' Perceived Interaction Survey (SPIS) developed by the researcher of the study.

Nine hypotheses were developed to examine whether there were positive relationships between different variables and course satisfaction. These variables included: student-instructor interaction, student-TA interaction, student-student interaction, student-content interaction, gender, academic classification, students' prior experiences with distance education in a partially online class setting, students' prior experiences with distance education in an entirely online class setting, and students' perceptions on how effective WebCT features were in helping them learn.

A survey research design was employed by this particular study. The survey used to collect data in this study, the Students' Perceived Interaction Survey (SPIS), was administered to the participants through WebCT, the online environment used for Computer Science 103. The survey was developed in four phases. In phase one, the original version of the survey was prepared, and the initial pilot exploratory data were collected. The second phase, the evaluation stage, involved the review of the survey by an expert committee of

professors. The third phase consisted of a pilot test: 20 Computer Science 103 Teaching Assistants took the survey, along with 46 current Computer Science 103 online students who participated voluntarily and anonymously. The survey was revised at each phase and finalized in the fourth phase.

The students who took the survey were enrolled in Computer Science 103 at Iowa State University in the fall of 2005. These students received cover letters asking for their voluntary participation, and students actually completed the survey between the dates of November 29, 2005 to December 7, 2005. The study was approved by the Human Subjects Review Committee at Iowa State University, and the students surveyed were an accurate reflection of the student population at Iowa State. The subjects were from a variety of ages, ethnicities, academic classifications, and majors. The participants took the survey individually using the WebCT Assessment Tool at any time they found convenient. The online distance education environment does not designate a certain time of the day for class work and accommodates 855 students; therefore, it was assumed that the student survey participants took the survey individually at whatever time they wanted. The results were individually separated.

SPSS was employed to analyze the results of the survey. Factor analysis was used to validate the effectiveness of the survey, and the Univariate General Linear Model procedure and Linear Regression Procedure in SPSS were used to perform a multiple regression analysis. This multiple regression analysis was used to determine the relationship between the independent variables and course satisfaction. Also, student demographic information was analyzed with descriptive statistics.

Out of the 949 students enrolled in Computer Science 103 for the fall semester of 2005, 46 participated in the pilot study and 855 voluntarily participated in the actual survey used for the study, resulting in a response rate of 94.7%. The data provided by these students are included in Tables 4.15, 4.16, 4.17, 4.18 and 4.19. These tables include information about gender, age, academic status, GPA, employment status, and ethnicity. Among the respondents, 52.4% were female, while 47.5% were male. In addition, the sample included students from different age groups; the majority of students who took Computer Science 103 were 18 to 25 years old (97.5%). Over 71% of students were from the freshmen and sophomore classes, while the remaining students were juniors and seniors. Approximately 64.5% of the students' GPAs were above 2.76. Only 39.9% of students were unemployed while taking the course, while the rest were involved in full or part-time work.

The majority of the sample (86.7%) was white; however, the survey did include students who were Asian, Black/African American, Hispanic, Multi-Ethnic, Native Hawaiian/Pacific Islander, American Indian or Alaskan, or even other ethnicities not specifically listed on the survey.

Major Research Findings and Discussion of the Results

The researcher developed a multiple linear regression model to study the relationships between different independent variables and course satisfaction. Multiple regression analysis, the method used to analyze the data for this study, includes many assumptions, including independence, equality of error variances, and normality of the residuals. All of these assumptions were examined and satisfied.

Regression analysis was the best method to analyze the data collected in this study. The model used a set of continuous and categorical variables to predict course satisfaction. Dummy variables were created for the categorical independent variables.

The model used for this study is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 Z_1 + \beta_9 Z_{21} + \beta_{10} Z_{22} + \beta_{11} Z_{23}$$

where Y = Course satisfaction

X_1 = WebCT effectiveness

X_2 = Prior partial online experience

X_3 = Prior entirely online experience

X_4 = Student-TA interaction

X_5 = Student-instructor interaction

X_6 = Student-student interaction

X_7 = Student-content interaction

Z_1 = Gender (Male)

Z_{21} = Year (Freshman)

Z_{22} = Year (Sophomore)

Z_{23} = Year (Junior)

Also, descriptive statistics were calculated for age, gender, race, and college classification. The value of R^2 was 0.702, determining that all the independent variables together could predict 70.2% of the variability of course satisfaction, which is fairly high.

The research results demonstrated that student-instructor, student-student, and student-content interactions, along with gender and student perceptions of WebCT features

were predictors of course satisfaction. A large percentage of the participants (93.6%) indicated they were satisfied with the course.

Moore (1989) found that there were three critical types of interaction in distance education: student-instructor, student-student, and student-content. Interaction is considered the key to success in traditional classrooms, as well as in the distance education environment (Fulford & Zhang, 1993). The results of this study strongly support this theory.

First Null Hypothesis:

There is no positive relationship between students' scores on the student-instructor interaction items in the SPIS instrument for distance education and their scores on the course satisfaction items in the SPIS instrument for distance education.

According to the results shown in Table 4.22, the *p*-value for the t test was 0.003, which was less than 0.05. Therefore, the null hypothesis was rejected. The results suggested that there was a positive and significant relationship between students' scores on the student-instructor interaction items in the SPIS instrument for distance education and students' scores on the course satisfaction items in the SPIS instrument for distance education.

Student-Instructor Interaction is a Predictor of Course Satisfaction

Moore and Kearsley (1996) indicated that the instructor is responsible for facilitating student-instructor, student-student, and student-content interactions in the distance education classroom environment. In addition, the interaction between the instructor and students is the foundation of the other two types of interaction. This type of interaction greatly impacts students' perceptions of distance education (Hiltz, 1995).

The results of this study indicated that increased student-instructor interaction improved students' levels of course satisfaction. Computer Science 103 presented several

opportunities for student-instructor interaction; these opportunities contributed to students' levels of satisfaction with the course.

Orientation Sessions Influence Students' Course Satisfaction

The first chance for the students to interact with the instructor happens at the course orientation session. The Computer Science 103 instructor, a WebCT senior certified trainer who originally designed the course, used this face-to-face opportunity to familiarize students with the course structure and materials. She used these orientation sessions to communicate her high expectations, go over the syllabus, and address important issues related to the course. Most importantly, these sessions helped establish student-instructor interaction. Students were divided into 25 sections, with each section consisting of 40 students. The orientation sessions lasted one hour, and were held in a computer lab where each student could sit at his or her own computer workstation. During these sessions, students logged into the Computer Science 103 course in WebCT and had the opportunity to explore the interface and ask questions about aspects of the class they did not understand. Step-by-step instructions were given by the instructor to direct students to key sources of information in WebCT.

In addition to introducing the basic course structure, the instructor emphasized the flexibility and convenience of the online course environment and pointed out that one of the key characteristics of student success was good time management skills. The instructor provided strong support for the students and reminded them to take responsibility for their own learning and complete all the assignments and tests before each deadline. She also reminded students to take the six tests required for the semester in the proctored environment of the Iowa State University LAS Online Test Center, and outlined the rules and procedures

for taking these exams. After the orientation sessions, students were familiar with the online course structure and had clear guidelines on all course activities. These orientation sessions allowed students to feel comfortable working independently throughout the rest of the semester. In addition, make-up orientation training sessions were provided for those students who missed the originally scheduled sessions.

These orientation sessions helped educate students on active learning and assisted them in remolding their passive learning paradigm. By the end of the semester, 97.6% of the Computer Science 103 students who responded to the survey agreed that they worked independently throughout the semester and understood that they needed to take responsibility for their own learning. Almost all (99%) of the students reported they worked on the course assignments at times they found personally convenient. The majority of respondents (95.9%) viewed themselves as self-motivated to complete all the class coursework to the best of their abilities, and 94.7% reported they actively participated throughout the semester in activities provided through the course that allowed them to contribute their own viewpoints.

Overall, these orientation sessions helped familiarize students with the course objectives and their own personal roles in learning for the semester. Because students understood how the course was organized, what their personal roles were, and what they could do if they needed any help, they were able to work independently for the rest of the semester. These sessions allowed students to be confident and knowledgeable of their responsibilities and trained them to be autonomous and active learners.

Online orientation sessions are an alternative to face-to-face orientation sessions, because instructors can construct streaming videos and post them on the course website at the beginning of the semester to acquaint students with the course material. The information in

these videos must be planned very well by the instructor, but students could benefit from learning about the course while being able to stay in the comfort of their own home. These orientation materials help students feel more prepared and motivated to do well in the class. Zhang (2005) and other researchers indicated that both face-to-face and online orientation methods can help distance learners adapt to online classrooms quickly.

Scagnoli (2001) believed universities should conduct online orientation sessions for distance education students, much like universities conduct orientation sessions for incoming freshmen. These orientation sessions help students adapt to a new environment and help them start something new successfully.

Conrad (2002) and others have found that learners want to know and understand the instructor's expectations and course objectives in the first week of class (Garrison & Brook, 1992; Oddy, 1992). Moore (1994) also has stated, "Learner autonomy should be a goal of distance education" (p.3). McCombs and Whisler (1997) emphasized that instructors need to focus on the needs of individual students to effectively motivate and teach students to make their classroom learner-centered. The results of this study are consistent with previous research works, and demonstrate the importance of student-instructor interaction and the role it plays in increasing students' levels of satisfaction.

Effective Communication Impacts Students' Course Satisfaction

A second element contributing to student-instructor interaction that impacted satisfaction in this study was effective communication. The WebCT email system was used by the Computer Science 103 instructor to communicate effectively with students on a regular basis. In this study, 98% of the participants reported that they checked their email regularly and received weekly emails containing updated course information from the

instructor. The weekly email updates from the instructor guided students to stay on track and urged them to focus on the current assignments and course content. Replies from the instructor within 24 hours also "shortened the distance" between the students and the instructor. These prompt responses facilitated a high level of student-instructor interaction.

A large percentage (98.8%) of the students indicated they were encouraged to send emails to the instructor when they had questions or encountered problems. Students also indicated that they replied to emails from the instructor, demonstrating students' proactive learning attitudes. The total amount of emails that the instructor sent and received throughout the fall 2005 semester was 50,917. Both students and the instructor facilitated two-way interaction in the class, providing strong evidence of effective and meaningful one-on-one communication. In addition to using email as a communication tool, the instructor also posted news on the WebCT class homepage each week, and posted messages on the discussion board. She tried her best to communicate with the students using a variety of tools to ensure students received the updated information in a timely manner. These types of communication are evidence of a learner-centered classroom because the instructor considered learners' needs (McCombs & Whisler, 1997) and used different active tools to interact with the students.

Furthermore, the instructor provided face-to-face office hours and TA help desks to assist those who needed additional face-to-face help. However, most of the students (96.2%) were able to follow the online instructions and did not need the face-to-face assistance throughout the whole semester.

Another effective communication and learning tool was the chat feature of WebCT. To utilize this feature, the students were divided into small groups for a one-hour chat

session. The discussion topics and outlines were sent to students one week before the chat sessions started, and students were asked to do research on the provided topics before they attended the session. During the chat session, students contributed their viewpoints and research findings to the whole group and interacted with the instructor and a guest speaker. Through this synchronous interactive communication, students reconstructed previous knowledge and built new knowledge in the discussed subject areas. After the chat sessions, the instructor received positive feedback. Students indicated they appreciated the opportunity to interact with the instructor, guest speaker, and their peers, and said the chat session helped them enjoy the course even more.

It was important that the online instructor served as the facilitator and effectively guided students to help them achieve their learning goals. The results of this study are consistent with Miner (2003) and others who echoed this same point (Dirr, 1999; Palloff & Pratt, 1999; Seaton, 1993). Effective communication between students and the instructor is a critical factor in students' course satisfaction.

A High Level of Feedback Boosts Students' Course Satisfaction

The third element that promoted student-instructor interaction and impacted satisfaction in this study was a high level of feedback. The ability to provide constructive feedback is one of the major challenges to the online instructor. The Computer Science 103 instructor did her best to reach this educational goal by making it a point to update the grade book promptly and frequently. Because campus edition version 4.1 of WebCT that Iowa State University used in the fall of 2005 did not provide multiple assignment drop boxes, it was not efficient to use one big drop box for a class of 949 students. The Computer Science 103 students' weekly assignments needed to be downloaded from the WebCT email system

and graded outside of WebCT. In order to distribute scores after the assignments were graded, a grading system was developed to record and organize these grades outside WebCT and then reload them back to WebCT to update students' grade books. Nearly all (93%) students agreed that the instructor updated the WebCT grade book frequently. Because the grade book was updated frequently, students knew exactly how they were doing in the class, which enabled them to learn more and encouraged performance improvement.

Another method adopted by the instructor to improve interaction was the provision of constructive feedback to the students. Over 98.1% of the participants from the study reported they received comments about their performance from the instructor regarding their case study projects, student homepage designs, weekly hands-on homework assignments, quizzes, simulation hands-on tests, mid-term and final exams, and up-to-date grades throughout the semester. The instructor's detailed and constructive comments and guidance motivated the students to learn from and correct their mistakes. Furthermore, students' weekly homework assignments were returned with comments in a timely manner, usually within one week. If students forgot to turn in their weekly homework, they received a follow-up email informing them their homework was not received one day after the deadline. These reminder emails encouraged students to focus on turning their homework in on time in the future. One additional method the instructor employed in her teaching was the metacognitive method, requiring students to write a mid-term self-evaluation report. These reports gave students the opportunity to reflect on their learning and become conscious of things they needed to do to improve their performance. This high level of interaction promoted proactive learning attitudes and encouraged students to work their hardest.

From this study, 90.4% of the participants stated that they enjoyed the class very much. The prompt feedback and constructive comments from the instructor increased students' enjoyment levels and influenced their course satisfaction.

Previous studies indicated that an extremely important aspect of teaching is feedback from the course instructor (Chickering & Gamson, 1991). The instructor's constructive feedback has a great impact on students' learning success in the online environment (Kearsley, Lynch, & Wizer, 1995). The results of this study are in accordance with these assertions.

Second Null Hypothesis:

There is no positive relationship between the students' scores on the student-TA interaction items in the SPIS instrument for distance education and their scores on the course satisfaction items in the SPIS instrument for distance education.

The mean of the student-TA interaction variable was 5.171. According to the results shown in Table 4.22, the regression coefficient of the student-TA interaction variable was estimated to be 0.017. The corresponding *p*-value for the t test was 0.196, which was greater than 0.05. Therefore, the null hypothesis was not rejected. It suggested that there was no positive and significant relationship between the students' scores on the student-TA interaction section in the SPIS instrument for distance education and their scores on the course satisfaction section in the SPIS instrument for distance education.

However, several circumstances could explain these results. Computer Science 103 was a large class that consisted of 949 students divided into 40-person sections with a total of 25 sections. A total of 25 section TAs were assigned to grade students' homework and answer questions from students regarding the class. In general, students appreciated the

work of the TAs. However, students' opinions about the quality of their own TA varied significantly. For example, some students reported that their TA did not respond promptly to student e-mails. The findings of this study agreed with Keinath's research (1991) when some students in the study indicated their frustration at not being able to get in touch with their TA when they needed the help, potentially affecting students' perceptions of student-TA interaction. The university should conduct TA training seminars in the beginning of the semester in order to equip TAs better.

Therefore, compared to other factors such as student-instructor interaction, student-student interaction, student-content interaction, WebCT features, and gender, student-TA interaction was not significant in predicting course satisfaction. The results of this study suggested that there was no positive relationship between student-TA interaction and course satisfaction. This result is consistent with Lya, Tjeerd & Wilmad's research (1999).

Third Null Hypothesis:

There is no positive relationship between the students' scores on the student-student interaction items in the SPIS instrument for distance education and their scores on the course satisfaction items in the SPIS instrument for distance education.

According to the results shown in Table 4.22, the *p*-value was less than 0.001. Therefore, the null hypothesis was rejected. The results suggested that there was a positive and significant relationship between the students' scores on the student-student interaction section in the SPIS instrument for distance education and their scores on the course satisfaction section in the SPIS instrument for distance education.

Student-Student Interaction is a Predictor of Course Satisfaction

Students in an online classroom environment often feel isolation and lack of interaction with other students. It is crucial for online instructors to develop a curriculum that actively promotes student-student interaction. Online classroom activities should be geared to promote the learning objectives and stimulate student interest during the learning process. There were several student-student interactions that occurred as part of this study that contributed to increasing students' levels of course satisfaction.

Constructivist and Cooperative Activities Improve Students' Course Satisfaction

The results of this study indicate that improved interaction, like student-instructor, student-student, and student-content interactions, leads to greater student course satisfaction. Within Computer Science 103, many constructivist and cooperative activities were included in this class. Students were required to work on a constructivist-based hands-on real-world project each week and take a simulation-based test each month. Besides these hands-on learning opportunities, students were grouped into 25 sections, with 40 students in each section. Within each 40-person section, students were assigned a partner from their section to work on a special class project called a case study. The instructor provided well defined real-world case study topics with clear instructions on how to complete research, and posted these topics on the discussion board. There were 20 different topics for the 20 groups in each section, with each topic divided into two different roles. This role player strategy is the key feature of group projects in an online course because it can prevent frustration and make student collaboration easier. This strategy allows students to discuss topics related to the class with their peers and develop learning and research plans. Students were required to post their research results on the discussion board for the whole section to view before the

deadline. After the deadline, students were encouraged to evaluate other groups' research results and post evaluation comments on the discussion board for the purposes of sharing information, building knowledge, and collaboration. Through these activities, students were able to apply knowledge they already had to construct new knowledge. These constructivist activities and cooperative case study group projects increased student-student interaction. The total amount of discussion board postings throughout the fall 2005 semester was more than 51,000.

Over 97% of survey participants indicated they appreciated the opportunity to work with partners on the case study project and post their findings on the discussion board for the class to see and learn from. After evaluating the work of other groups in their section, over 83.6% indicated they posted at least 60 comments about the work of other groups. Many participants (94.5%) indicated that they received at least 40 comments from other students within their section.

The results of Slavin's research (1983) indicated that the utilization of cooperative learning methods could affect students' achievement levels significantly, improve friendships across ethnic groups, improve students' self-esteem levels, and positively affect their interactions with academically handicapped students. In addition, the cooperative learning method could empower students' critical thinking skills and ensure active learning (Litchfield, 2000). This study supports the findings of both Slavin and Litchfield.

In addition, cooperative learning can help students learn problem-solving skills, reduce student isolation, generate student-student interaction, and improve course satisfaction. Through cooperative case study learning activities, students were motivated to

construct knowledge and interact with other students. These activities helped create a learner-centered environment.

Community Building Enhances Students' Course Satisfaction

Another way to increase student-student interaction is to build an online learning community, which is one of the biggest challenges for online instructors. The Computer Science 103 instructor tried to build this online community by sending a welcome letter to students one week before school started. During the first week of school at the face-to-face orientation sessions, students met with other students in their own section and exchanged contact information with their group mates and were encouraged to introduce themselves in the online environment by posting information about themselves, such as their major, hobbies, favorite food, stories about their pets, and how they felt about the online class on the discussion board. Students were encouraged to view other students' postings and respond to their peers' opinions.

During the semester, students were also encouraged to build their own homepage within WebCT to help their fellow students get to know them more. Students shared some personal information on their homepages for others to view, and after the deadline of the project, students were required to evaluate other students' homepages. Students were then asked by the instructor to select the top four homepages within their own section. A total of 100 students within the whole class were rewarded with extra-credit points. This reward system excited students and increased student-student interaction.

Besides the discussion board, case study group projects, and the student homepage design project, the chat sessions also can build an online community and enhance student-student interaction. The instructor of this course took learners' talents, backgrounds,

interests, and learning capacities into account and facilitated activities that motivated learners' achievement. Huba and Freed (2000) and McCombs and Whisler (1997) found that it was important to take individual student abilities and needs into consideration in any instructional setting. Many participants (90%) within this study indicated that they appreciated the opportunities provided for students to get to know each other better in the Computer Science 103 online community.

Fourth Null Hypothesis:

There is no positive relationship between the students' scores on the student-content interaction items in the SPIS instrument for distance education and their scores on the course satisfaction items in the SPIS instrument for distance education.

According to the results shown in Table 4.22, the *p*-value for the t test was less than 0.001. Therefore, the null hypothesis was rejected. The results suggested that there was a positive and significant relationship between the students' scores on the student-content interaction section in the SPIS instrument for distance education and their scores on the course satisfaction section in the SPIS instrument for distance education.

Student-Content Interaction is a Predictor of Course Satisfaction

In distance education, the instructor's role is not only to facilitate, but to design the course content as well. The instructors must spend time investigating the course management system to fully understand the interface used for their courses. The course material should be designed in a systematic format so students can easily navigate through the course material to optimize their in-depth learning.

Technology should be used to enhance, not hinder, effective student learning. The curriculum should be well-designed and incorporate technology wisely so students receive

information communicated effectively. Also, the course material should support different learning styles, thus enhancing students' course satisfaction.

The results of this study indicated that increased student-content interaction improved students' course satisfaction. Several types of student-content interaction contributed to students' satisfaction with the course.

Well Organized Course Structure Influences Students' Course Satisfaction

Online course instructors are consistently challenged to become not only content experts but also pedagogical experts. A pedagogical expert knows how to design and present teaching materials within a systematic structure that allows students to navigate and find information efficiently. After designing the content of the course, the instructor should examine the course structure and organization of the WebCT course interface. Quality course information that is highly organized and delivered efficiently can motivate students to learn and can influence students' course satisfaction.

Besides providing rich teaching content, the instructor should attempt to mimic a typical student to discover the most effective and successful paths for students to access course information. All related information in the course should be presented within an organized group of pages instead of several single pages within WebCT. These organized pages serve as a container, allowing the instructor to group each week's material within a module. Many online instructors do not fully understand the WebCT course management system and err in using several single pages to present the course material each week. The organization of this information is overwhelming, forcing students to struggle to find information in several different locations and put it all together each week. Disorganization misuses students' time and causes frustration and confusion when they interact with the

course content. Therefore, the course content organization is one of the most critical components that directly influences student course satisfaction.

In this study, over 96.8% of the participants reported that the Computer Science 103 WebCT course materials were indeed well organized. The instructor designed the course materials using a systematical model that contained a nested structure, utilizing the WebCT organized page feature to design each week's course content. Students just needed to click the weekly modules link under the course menu to access all the information they needed to know. At that point, an organized page appeared that contained all of the information for a specific week in the semester (see Appendix D). Students only needed to click the current week module (for example: week 11 module) and another organized page appeared. Within this organized page, all of the course material was arranged in numerical order (see Appendix E). Everything students needed to know and learn about the week's assignments and course content was contained in the current week's module, preventing students from needing to navigate through many different areas of WebCT each week. This method was very straight forward and made online education easier and more enjoyable for the students. Lynch (2002) indicated that well organized course material can increase student satisfaction. Because the instructor was concerned about the students' needs, there was evidence of a learner-centered classroom (Lambert & McCombs, 1998).

In addition, the course menu, the main navigational tool for Computer Science 103 students within WebCT, was organized in a clear and logical format, supplying the most important information to the class in an easily understood manner. Information students absolutely needed to be aware of to succeed in the class was given a clearly labeled category for easy access by the students. For example, links entitled "Assessment," "Calendar,"

"Discussion Board," "E-mail," "FAQ," "Syllabus," and "Weekly Modules" were included (see Appendix D), allowing students to access the information they needed most often with a simple click of the mouse.

Computer Science 103 is an undergraduate fundamental computer literacy and software application class. In order to help students focus, the instructor adopted the strategy of releasing only one module each week, helping students focus on the material for that week only. This tactic helped prevent the distractions of working ahead or cramming to finish the class. Students were allowed to review the previous modules, but were required to follow the class schedule week by week and learn the material in-depth. The results from this study showed that 99% of the participants indicated that each new weekly module was available every Monday. Students could work on their homework, take the weekly quiz, or read the course material anytime or anywhere from Monday to Sunday within that week. Out of all the survey participants, 97.7% expressed that the course provided more flexibility than a traditional class, allowing them to better manage their time to complete the coursework. The homework and quiz deadlines came each Sunday night at 11pm; however, students could still review the course material anytime after the deadline. The majority of the students were satisfied with this format; 99% of the respondents indicated that they worked on the course assignments for the class at times they found convenient each week.

Rich Content Facilitates Students' Course Satisfaction

The production of online lectures requires a qualified individual because a certain amount of expertise is necessary to produce a quality product. The Computer Science 103 instructor spent sufficient time investigating the different types of software for distance education to choose the one that was most compatible with the course objectives. The

newest pedagogical advancements, technology developments, and knowledge of how multimedia products could be effectively incorporated into distance education were all considered in developing the technological elements of Computer Science 103.

After researching and analyzing the different types of distance education software available, the instructor chose the programs Cool Edit 2000, Macromedia Breeze, and Camtasia Studio to construct online lectures. These programs were beneficial for this type of production because they allowed users to view a standard lecture found in any given class in an interactive presentation that could be made available to students on their personal computers. Making these lectures interactive involved several steps. After the instructor planned out what information would be contained in the lecture, she used the Cool Edit program to make an audio recording of the information. Next, she used Breeze to combine the audio with an existing PowerPoint presentation to create a Macromedia Flash movie of the lecture. She then published the movie on the course website.

One of the main limitations of traditional lessons is that students are often unable to view and explore the material outside of the classroom walls. This is particularly detrimental for those students who need to interact with the material at their own pace to acquire an understanding of the course content. As a result, Camtasia is a beneficial program for those students who learn through interaction, because Camtasia allows users to make a video recording of their actions on the computer screen. With this program, the instructor provided students with the precise steps necessary to perform a task in Microsoft Word, or any of the other Microsoft Office programs studied in the class. Camtasia proved to be an invaluable tool for reducing confusion throughout the course.

One of the greatest advantages of the Computer Science 103 online lectures was that the final product accommodated the needs of a vast range of students. Because the class content was available online, students were free to learn at the times and paces that were most convenient for them. Furthermore, they could easily go back and review any material that was confusing, or that they might have overlooked. Each lecture was divided into four units, each unit containing a homework question at the end. These questions were intended to help kinesthetic learners, because they were designed for students to actively implement knowledge they acquired right away. It only took 10-15 minutes for students to view the lecture for each unit. Also, the lecture's narrations enabled auditory learners to better grasp the material, while the images, animations, and PowerPoint slides were beneficial to visual learners. In addition, because the lectures incorporated a combination of both audio and visual elements, students with hearing, visual, or other disabilities were still able to view and understand the lecture material. The instructor took into account individual learning styles and strove to produce high-quality streaming lectures to motivate student learning. These streaming lectures presented evidence of a learner-centered classroom. Lambert and McCombs (1998) emphasized that instructors need to focus on the individual learners' needs to promote effectively the highest level of motivation and learning in a learner-centered classroom. Finally, these lectures were advantageous because students did not need to download the lectures to watch them. Instead, they could be viewed immediately by streaming them off the course server. This convenient method allowed students anywhere in the world, even those with the slowest internet connections, to be able to view the lectures quickly and easily.

Because technology is continuously changing, online instructors should constantly familiarize themselves with the newest developments and research on technology. They should be willing to change their practices so they can continue to meet the needs of not only the students of today, but those of tomorrow.

In this study, 94.2% of the respondents indicated that they were satisfied with the quality of the streaming lectures. These streaming lectures can assist student learning, facilitate student-content interaction, and increase learning retention.

According to Choi and Johnson (2005), video-based instruction methods provided higher retention rates than the traditional text-based instruction. Johnson's assertions are supported by the results of this study.

Furthermore, the instructor posted simulation projects and many other content-rich course materials in each weekly module for students to learn. Because of the instructor's extra efforts, over 97.1% of the participants indicated that they were satisfied with the content of the course. Furthermore, 93.2% of the participants responded that they were satisfied with the amount of learning they achieved in the class.

Fifth Null Hypothesis:

The mean score for the female participants is equal to or greater than the mean score for the male participants in the course satisfaction items in the SPIS instrument for distance education.

According to the results shown in Table 4.20, the *p*-value for the t test was 0.002, which was less than 0.05. Therefore, the null hypothesis was rejected, suggesting that the mean score of the female was less than the mean score of male on the course satisfaction

items in the SPIS instrument for distance education. The mean for males was 5.263, while the mean for females was 5.164. Males were more satisfied than females with the course.

Gender is a Predictor of Course Satisfaction

The results of this study demonstrated that both male and female participants were very satisfied with the course. However, males were slightly more satisfied with the course than females. The mean score of course satisfaction for males was 5.263 out of 6 on the 6-point Likert scale, while the mean for females was 5.164 out of 6. Among the participants, there were 52.4% (448) female students and 47.5% male (406) students. This online course provided flexibility, social presence, a cooperative learning community, along with high quality student-instructor, student-student, and student-content interactions. These components were satisfactory for both male and female students. Pascarella and Ternzini (2005) indicated that men performed better than women in the areas of mathematics and science, and Kearsley (2000) and many others indicated that males held more positive attitudes toward computers and technology than females (Furger, 1998; Shashaani, 1994; Spender, 1995, Ullman, 1997). Furthermore, Keinath (1991) indicated that females often felt like they did not have enough time to complete everything they wanted, not only in coursework, but in all aspects of life. Computer Science 103 was a four-credit hour computer course, and students were expected to spend at least 10-12 hours each week working on hands-on computer projects, quizzes, and other special projects. Students also needed to take four simulation tests and the mid-term and final exams throughout the whole semester. With a heavy load of coursework, females might have felt they had less time to accomplish the required assignments in the class and were therefore less satisfied than males with the course.

The findings of this study were consistent with the findings of other researchers that females were less satisfied than male students with technology-driven courses. Bell (1994) also reported similar findings in his study.

Sixth Null Hypothesis:

There is no positive relationship between students' classifications and their scores on the course satisfaction items in the SPIS instrument for distance education.

According to the results shown in Table 4.20, the *p*-value for the t test was 0.165, which was greater than 0.05. Therefore the null hypothesis was not rejected. There was no positive relationship between students' academic classifications and students' scores on the course satisfaction section in the SPIS instrument for distance education.

Sophomore Computer Science 103 participants outnumbered students from all other academic classes, making up 41.9% of the total sample. Freshmen were the next highest percentage with 29.1%, while juniors and seniors accounted for 19.9% and 9%, respectively. This study suggested that there was no positive relationship between a student's academic year and course satisfaction. Although Computer Science 103 was an entry-level computer course, the projects and examinations were seen as academically challenging to all students. At the end of the semester, students indicated that the course was very practical and informative and that they learned a lot from the course even though the seniors were already familiar with some of the information that was covered. Over 93.2% of students indicated that they were satisfied with the amount of learning they achieved in this class.

Zhang (2005) also found that there was no significant relationship between age and how receptive distance education learners were. However, Lim (2001) found that there was a negative relationship between academic status and course satisfaction. The results of this

research are consistent with Zhang's findings, indicating no significant relationship between academic classification and course satisfaction.

Seventh Null Hypothesis:

There is no positive relationship between students' amount of prior distance education experience in partial online class settings and their scores on the course satisfaction items in the SPIS instrument for distance education.

According to the results shown in Table 4.22, the *p*-value for the t test was 0.471, which was greater than 0.05. Therefore, the null hypothesis was not rejected. There was no positive relationship between students' prior experiences with distance education in partially online class settings and their scores on the course satisfaction section in the SPIS instrument for distance education. Discussion regarding this hypothesis is closely tied with the next hypothesis, and will be included in the next section.

Eighth Null Hypothesis:

There is no positive relationship between students' amount of prior distance education experience in an entirely online class and their scores on the course satisfaction items in the SPIS instrument for distance education.

According to the results shown in Table 4.22, the *p*-value for the t test was 0.190, which was greater than 0.05. Therefore, the null hypothesis was not rejected. There was no positive relationship between students' prior distance education experience in an entirely online class and their scores on the course satisfaction section in the SPIS instrument for distance education.

The results of this study indicated that previous experiences with online courses did not contribute to course satisfaction. Several factors could have contributed to these results:

first, the course was well organized. A well organized course structure and course materials helped students easily find the information they needed. According to students' responses, 96.8% of respondents believed the course was well organized. Second, successful orientation sessions helped students understand what they needed to do to succeed and made online learning easy and enjoyable. Over 90.4% of participants stated that they enjoyed the class very much. These sessions also helped students gain step-by-step hands-on experience on how to use the WebCT features, reducing their anxiety about the course at the very beginning of the semester. Third, the technologies adopted by the instructor in this class did not become obstacles to learners; instead, they became vehicles to promote active learning. Overall, 97.5% of participants stated that the WebCT features used in the class were easy to learn. Fourth, the course instructor served as a facilitator and guide and sent informational updates through email to students on a weekly basis throughout the semester. This high level of communication helped students stay on task and helped them be more satisfied with the course. Therefore, the students' prior experiences with distance education were not significantly related to their course satisfaction. These results are consistent with the findings of Fox (2000) and Lai (2004).

Ninth Null Hypothesis:

There is no positive relationship between students' scores on their perceptions of the effectiveness of the WebCT features items in the SPIS instrument for distance education and their scores on the course satisfaction items in the SPIS instrument for distance education.

The mean of the WebCT features variable was 5.055. According to the results shown in Table 4.22, the *p*-value was less than 0.001. Therefore, the null hypothesis was rejected, suggesting that there was a positive and significant relationship between students' scores on

the effectiveness of WebCT features section in the SPIS instrument for distance education and students' scores on the course satisfaction section in the SPIS instrument for distance education.

WebCT Features are a Predictor of Course Satisfaction

There were several active WebCT features adopted by the instructor of this course that promoted active student learning and increased interaction between students and the instructor, other students, and the course content. The use of these features also built an online learning community. The results of this study can help online educators identify the most effective WebCT tools to enhance their teaching.

E-Mail Feature: The main communication tool in this class was the email feature. Students used email to contact the instructor, other students, and their section TA regarding class material. Over 94.5% of the participants reported that when they had questions about the course, they used the WebCT email feature to contact the instructor or section TA to solve their problems.

Discussion Board Feature: Students were invited to post their personal information such as their name, major, hobbies, favorite foods, and their opinions about online courses during the first week of the semester. Students also were required to post their case study group projects on the discussion board and were asked to read other groups' research results and provide constructive comments and suggestions. The instructor could view students' work and interact with students, and could either moderate the discussion topics personally or assign students to moderate the discussion topics each week. The discussion board facilitated student-instructor, student-student, student-content, and student-TA interaction, and served as

an active tool to help students get involved in class activities. Participants (93.9%) agreed that the discussion board feature helped their learning.

Grade Book Feature: The grade book is an important tool for instructors to communicate with the students regarding their learning progress. A large percentage of students (98.6%) indicated that the grade book helped them track their progress in the class, which motivated them to learn more and provided encouragement for students to improve their performance.

Quiz Feature: Students took a quiz each week and completed several examinations through the WebCT assessment tool throughout the semester. Many students (95.6%) agreed that the feature helped them access their knowledge of the course material.

Calendar Feature: The updated calendar for the whole semester was released to students before the semester started. Survey participants (84.6%) responded that the calendar feature helped familiarize them with the semester class schedule, and helped them prepare in advance for upcoming assignments.

Organize Page Feature: The Computer Science 103 instructor developed the weekly module using WebCT organized pages. These pages were organized so that students could access all the material for one week of class in one centralized location. The information in these modules was organized in a logical, clear manner, preventing students from needing to navigate through excessive online text to find information they needed. Over 98.6% of participants indicated that the weekly module feature helped them keep track of their course assignments and learn the course content effectively.

Student Homepage Feature: Computer Science 103 students were encouraged to develop their own personal homepage within WebCT. Although building a student

homepage was not a required project for the class, 89.30% of participants agreed that the WebCT student homepage feature helped them get to know other students in the class. It reduced students' feelings of isolation and helped students establish ownership of the course, and also helped build a strong online community and student social presence.

Chat Feature: The chat feature was used to help students have real time communication with the instructor, their TA, and other students in their section. Chat session discussion topics were sent to students one week in advance, and students were asked to do some research so they would come to the discussion knowledgeable and prepared. This synchronous interaction over course material helped students build on their previous knowledge and construct new knowledge. The chat sessions were very popular; the instructor received a lot of positive feedback from students about the sessions. Even though students were not required to attend, 74.2% of the survey participants believed the chat feature facilitated interaction.

Overall, 97.5% of participants within this study stated that the WebCT features used in this class were easy to learn. The effectiveness of these WebCT tools can enhance students' learning experiences (Lai, 2004). The results of this study are consistent with Lai (2004) and others who echoed this same point (LeRouge, Blanton, & Kittner, 2002; Hutchins, 2001; Robertson & Klotz, 2001; Sabine, 1998).

Limitations of the Study

The participants of this study were the 949 students enrolled in Computer Science 103 for the fall of 2005 semester at Iowa State University. The course was taught in the WebCT environment. However, the results of this study depended on the educators' interpretations and may not apply to other course management platforms. Because of the

lack of randomization, it is hard to know if the results can be generalized beyond Iowa State University. Therefore, a need exists for a random sample from undergraduate students all around the country who are taking a similar course to Computer Science 103. Also, the course quality was the only measure employed to investigate students' levels of course satisfaction; other measures such as students' grades were not examined. This study examined only students' perceptions of the relationships between interaction and course satisfaction, and did not examine the impact of students' different learning styles and instructors' different teaching styles on interaction and course satisfaction.

Conclusion and Recommendations

Distance education has become a popular method for teaching around the country (Fox, 2000). However, many people are concerned about the quality of distance education (Bernard, Brauer, Abrami & Surkes, 2004; Russell, 1999). The role of interaction always has been important to education, because it is the medium through which students communicate, work with each other, and learn course content. Therefore, interaction is important to consider in a distance education environment. Online educators should develop an online learning community that combines student-instructor, student-content, and student-student interactions (Anderson & Garrison, 1997; Garrison & Cleveland-Innes, 2005; Moore, 1989) and effectively utilizes technology to facilitate student learning. Fulford and Zhang (1993, 1994) stated that students' perceptions of interaction are the critical predictors of student satisfaction. Zhao et al. (2005) indicated that distance education is not effective without interaction.

This study aimed to examine the relationships between students' perceptions of course-related interaction and their levels of satisfaction with the course. The results of the

study suggested that student-instructor, student-student, and student-content interactions, along with gender and student perceptions of WebCT features were predictors of course satisfaction.

At end of the semester, a large percentage of the participants (93.6%) indicated they were satisfied with the course. Many participants (93.2%) indicated that they preferred the web-based setting to a traditional face-to-face lecture setting for education. These results strongly suggested that online courses are indeed quality opportunities for education, and demonstrated that students actually favor courses taught in the online environment over those taught in a traditional face-to-face classroom.

Based on these research findings, several recommendations can be made regarding how to create a learner-centered online classroom that incorporates effective WebCT features, increases student-instructor interaction, increases student-student interaction, and increases student-content interaction.

Incorporate Effective WebCT Features

Incorporating effective WebCT features in course design is key in increasing interaction in the online environment. This research helped online educators identify several WebCT features that can increase student-instructor, student-student, and student-content interactions. The email feature can facilitate active communication in the online environment, and the discussion board feature can promote active learning, increase students' critical thinking skills, and enable students to share their viewpoints with others. It also can help the instructors demonstrate diverse learning. The grade book and quiz features can help students track their progress in the course by providing prompt feedback and facilitating a time-on-task learning attitude. The calendar feature can provide students with updated

schedules and due dates for activities they need to complete. The organized page feature can help the instructor organize the course material into weekly modules to make learning easier and more effective. The student homepage feature can provide a social presence and build a strong online community. The chat feature can help students and instructors discuss topics in a synchronized environment, facilitating diverse learning and prompt feedback.

These WebCT features can promote student-instructor, student-student, and student-content interactions. The results of this study suggest for online instructors to integrate these features in their course development and create a learner-centered, active online environment.

Increase Student-Instructor Interaction

To increase student-instructor interaction, the instructor should serve as a facilitator and guide. Either a face-to-face orientation session or an online orientation session should be conducted in the first week of the semester to help educate students on active learning and how to implement these active learning techniques in their study times. These sessions also familiarize students with the course objectives and their own personal roles in learning for the semester. Because students understood how the course was organized, what their personal roles were, and what they could do if they needed any help, they were able to work independently for the rest of the semester. These sessions helped students become confident and knowledgeable of their responsibilities and trained them to be autonomous and active learners. Choosing to incorporate these orientation sessions will help students feel more prepared and motivated to do well in the class.

Many people are concerned about the quality of online courses, especially with respect to cheating (Moore, 2005). Computer Science 103 solved this problem by adopting a

proctored test model. Students were required to complete the six examinations required for the course in the Iowa State University LAS online test center. The tests each were available for one week, and students had the flexibility to take the test at any time the test center was open. This method, although effective for Computer Science 103, may not work for students who do not live on campus. Iowa State has offered off-campus versions of Computer Science 103 for those who live outside the city of Ames. Therefore, a testing solution for these students might be to find a proctor from either a public library staff or a public school teacher. The instructor could contact the proctor to make sure the test policies were carried out properly for each test, ensuring the quality of an online exam.

Online instructors should train students to be autonomous learners, and can use the orientation sessions to communicate the importance of an independent work attitude and time management skills. This type of effective communication impacts students' course satisfaction. Weekly updated email from the instructor can help students focus on the course tasks. Additionally, the high level of prompt feedback and constructive, detailed comments from the instructor can improve students' learning and increase their course satisfaction.

Increase Student-Student Interaction

This research also suggests that instructors develop a curriculum incorporating constructivist and cooperative learning methods to actively promote student-student interaction and reduce students' feelings of isolation. These types of activities should stimulate student interest and help build connections between students. Peer evaluations are one way of encouraging students to interact with each other because they help students appreciate other students' work and allow them to learn from each other. The chat and discussion board activities for co-construction of knowledge and case study group projects

for real-world application can also promote students' problem solving skills and increase student-student interaction.

From the survey results, students felt they were encouraged to build their own homepage within WebCT, and indicated that the project helped them get to know each other. Therefore, instructors can use this feature to build online community and help students communicate with each other in constructing the projects and appreciate each other's homepages. These types of projects can help the instructor engage students in a learner-centered classroom.

Increase Student-Content Interaction

The results of the study suggested student-content interaction is one of the predictors of course satisfaction. Therefore, instructors are advised to adopt technology wisely. The instructors should also work with the course instructional designer to develop a systematic structure for the course material. The instructors should become not only content experts but also pedagogical experts to develop high-quality course material for their online students. Well-organized, rich course material can engage students in the learning process and make the learning experience easy and pleasant. These elements can help instructors facilitate effective online classes and motivate students to learn actively.

In this study, 97.1% of participants indicated that they were satisfied with the course content. Over 90.4% of the participants reported that they enjoyed the course, and 93.2% of the participants indicated they were satisfied with the amount of learning they achieved in the class. About 89.5% of the participants reported that they appreciated the opportunities for students to get to know each other better in the online community. Many participants (97.7%) agreed that the course provided them with more flexibility than a traditional class,

and 99% of the participants stated that they worked on the course assignments at times they found convenient. The results of this study indicated that the effectiveness of the student-instructor, student-student, and student-content interactions were the predictors of course satisfaction. Furthermore, WebCT features and gender were predictors of course satisfaction as well.

Ritchie and Newby (1989) stated that students experienced less enjoyment in the distance education environment. The results of this study were contradictory to Ritchie's research. From this study, the majority of the participants (90.4%) indicated that they enjoyed this online course.

Summary

As distance education has become a more and more popular educational practice, it is crucial to examine online course quality. For students to learn successfully, teachers must present clear goals and objectives so students do not get frustrated (Porter, 1997). Instructors in the online environment must plan and execute their lessons clearly and effectively to help students learn the maximum amount of information (Barker & Patrick, 1989).

There are many ways to promote learner achievement in online class environments, but learner satisfaction is one especially important component in successful distance education courses (Ritchie & Newby, 1989). Some researchers believe student satisfaction should be examined before learning outcomes, because students' negative opinions can hinder their learning (Biner, Dean & Mellinger, 1994). Student satisfaction should be taken into account by instructors because attitudes are often indicative of success. The results of this research can help educators create a rich distance education environment that encourages students to enjoy what they're learning and perform well.

Suggestions for Further Research

These research results showed that student-instructor, student-student, and student-content interactions, as well as gender and WebCT features are predictors of course satisfaction. The following are suggestions for future research:

1) Investigate if increased interaction will increase student learning outcomes measured by grades or academic achievement.

2) Replicate this study on a national level for undergraduate students who are taking a similar course using various course management systems.

3) Replicate this study in other courses in other subject areas.

4) Conduct a qualitative research study to investigate students' perceptions of the relationships between interaction and their course satisfaction.

5) Conduct an experimental group and a control group to measure if increasing interaction will increase course satisfaction. One group would require little to no interaction, while another group would be given a sufficient amount of interaction.

6) Conduct the same study on different course management platforms other than WebCT.

7) Determine if the research results concerning gender and preference remained consistent on another subject matter. This course was a computer science course; perhaps a broader subject area would change the results.

8) Determine whether other factors affect interaction, such as students' learning styles and instructors' teaching styles, which are not addressed in this study. Further study is needed in these areas.

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APPENDIX A

HUMAN SUBJECT APPROVAL FORM

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office of Research Assurances
Vice Provost for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4566
FAX 515 294-4267

DATE: November 10, 2005

TO: Shu-Hui Chang
FROM: Human Subject Research Compliance Office

RE: **IRB ID #** 05-482
STUDY REVIEW DATE: November 9, 2005

The Institutional Review Board has reviewed the project, "An Assessment of the Effectiveness of Interaction in Distance Education Based on Student Satisfaction with the Learner- Centered Paradigm" requirements of the human subject protections regulations as described in 45 CFR 46.101(b)2. The applicable exemption category is provided below for your information. Please note that you must submit all research involving human participants for review by the IRB. Only the IRB may make the determination of exemption, even if you conduct a study in the future that is exactly like this study.

The IRB determination of exemption means that this project does not need to meet the requirements from the Department of Health and Human Service (DHHS) regulations for the protection of human subjects, unless required by the IRB. We do, however, urge you to protect the rights of your participants in the same ways that you would if your project was required to follow the regulations. This includes providing relevant information about the research to the participants.

Because your project is exempt, you do not need to submit an application for continuing review. However, you must carry out the research as proposed in the IRB application, including obtaining and documenting (signed) informed consent if you have stated in your application that you will do so or required by the IRB.

Any modification of this research must be submitted to the IRB on a Continuation and/or Modification form, prior to making any changes, to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

cc: Agriculture & Biosystem Engineering
Roger Smith

Applicable exemption category(s):

(1) Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

(3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) Federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

(4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

(5) Research and demonstration projects which are conducted by or subject to the approval of Department or Agency heads, and which are designed to study, evaluate, or otherwise examine: (i) Public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.

(6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

ORIGINAL

Review Date:		IRB ID: 05-482
Approval Date:		Length of Approval:
Approval Expiration Date:		FULL Committee Review:
EXEMPT per 45 CFR 46.101(b): 2	Date: 11/9/05	Minimal Risk: ✓
EXPEDITED per 45 CFR 46.110(b)		More than Minimal Risk:
Category	Letter	Project Closed Date:

IRB
OCT 17 2005

ISU NEW HUMAN SUBJECTS RESEARCH FORM

SECTION I: GENERAL INFORMATION

Principal Investigator (PI): Shu-Hui Chang	Phone: 572-4167	Fax: 294-0258
Degrees: Master of Science	Correspondence Address: 38B Schilletter Village, Ames, IA. 50010	
Department: Agriculture and Biosystem Engineering	Email Address: shchang@iastate.edu	
Center/Institute:	College: College of Agriculture	
PI Level: ☐ Faculty ☐ Staff ☐ Postdoctoral ☒ Graduate Student ☐ Undergraduate Student		

Title of Project: An Assessment of the Effectiveness of Interaction in Distance Education Based on Student Satisfaction with the Learner - Centered Paradigm

Project Period (Include Start and End Date): [*mm/dd/yy*][*11/01/05*] to [*mm/yy/dd*][*8/30/06*]

FOR STUDENT PROJECTS

Name of Major Professor/Supervising Faculty: Dr. Roger Smith	Signature of Major Professor/Supervising Faculty: Roger Smith
Phone: 294-7001	Campus Address: E252 Lmarcino
Department: Educational Leadership and Policy Studies	Email Address: rasmith@iastate.edu

Type of Project: (check all that apply)
☐ Research ☐ Thesis ☒ Dissertation ☐ Class project
☐ Independent Study (490, 590, Honors project) ☐ Other. Please specify:

KEY PERSONNEL

List all members and relevant experience of the project personnel. This information is intended to inform the committee of the training and background related to the specific procedures that the each person will perform on the project.

NAME & DEGREE(S)	SPECIFIC DUTIES ON PROJECT	TRAINING & EXPERIENCE RELATED TO PROCEDURES PERFORMED, DATE OF TRAINING
Shu-Hui Chang	Investigator	IRB certificate, 04/05

Add New Row

FUNDING INFORMATION

Internally funded, please provide account number: N/A
Externally funded, please provide funding source and account number: N/A
Funding is pending please provide OSPA Record ID on GoldSheet: N/A
Title on GoldSheet if Different Than Above: N/A

Other: *e.g., funding will be applied for later.* N/A

SCIENTIFIC REVIEW

Although the compliance committees are not intended to conduct peer review of research proposals, the federal regulations include language such as "consistent with sound research design," "rationale for involving animals or humans" and "scientifically valuable research," which requires that the committees consider in their review the general scientific relevance of a research study. Proposals that do not meet these basic tests are not justifiable and cannot be approved. If a compliance review committee(s) has concerns about the scientific merit of a project and the project was not competitively funded by peer review or was funded by corporate sponsors, the project may be referred to a scientific review committee. The scientific review committee will be ad hoc and will consist of your ISU peers and outside experts as needed. If this situation arises, the PI will be contacted and given the option of agreeing that a consultant may be contacted or withdrawing the proposal from consideration.

☐ Yes ☒ No Has or will this project receive peer review?

If the answer is "yes," please indicate who did or will conduct the review:

If a review was conducted, please indicate the outcome of the review:

NOTE: RESPONSE CELLS WILL EXPAND AS YOU TYPE AND PROVIDE SUFFICIENT SPACE FOR YOUR RESPONSE.

COLLECTION OR RECEIPT OF SAMPLES

Will you be: (Please check all the apply.)

☐ Yes ☒ No Receiving samples from outside of ISU? See examples below.
☐ Yes ☒ No Sending samples outside of ISU? See examples below.

Examples include: genetically modified organisms, body fluids, tissue samples, blood samples, pathogens.

If you will be receiving samples from or sending samples outside of ISU, please identify the name of the outside organization(s) and the identity of the samples you will be sending or receiving outside of ISU:

N/A

Please note that some samples may require a USDA Animal Plant Health Inspection Service (APHIS) permit, a USPHS Centers for Disease Control and Prevention (CDC) Import Permit for Etiologic Agents, a Registration for Select Agents, High Consequence Livestock Pathogens and Toxins or Listed Plant Pathogens, or a Material Transfer Agreement (MTA) (http://www.ehs.iastate.edu/bs/shipping.htm).

SECTION II: APPLICATION FOR INSTITUTIONAL REVIEW BOARD (IRB) APPROVAL

☒ Yes ☐ No Does this project involve human research participants? If the answer "no" is checked, you will automatically moves to a question regarding the involvement of radiation producing devices in your project.

SECTION III: ENVIRONMENTAL HEALTH AND SAFETY INFORMATION (EH&S)

☐ Yes ☒ No Does this project involve laboratory chemicals, human cell lines or tissue culture (primary OR immortalized), or human blood components, body fluid or tissues? If the answer is "no" is checked you will automatically move to a question regarding the involvement of human research participants in your project.

ASSURANCE

- I certify that the information provided in this application is complete and accurate and consistent with any proposal(s) submitted to external funding agencies.
- I agree to provide proper surveillance of this project to ensure that the rights and welfare of the human subject or welfare of animal subjects are protected. I will report any problems to the appropriate compliance review committee(s).
- I agree that I will not begin this project until receipt of official approval from all appropriate committee(s).
- I agree that modifications to the originally approved project will not take place without prior review and approval by the appropriate committee(s), and that all activities will be performed in accordance with all applicable federal, state, local and Iowa State University policies.

CONFLICT OF INTEREST

A conflict of interest can be defined as a set of conditions in which an investigator's or key personnel's judgment regarding a project (including human or animal subject welfare, integrity of the research) may be influenced by a secondary interest (e.g., the proposed project and/or a relationship with the sponsor). ISU's Conflict of Interest Policy requires that investigators and key personnel disclose any significant financial interests or relationships that may present an actual or potential conflict of interest. By signing this form below, you are certifying that all members of the research team, including yourself, have read and understand ISU's Conflict of Interest policy as addressed by the ISU Faculty Handbook (http://www.provost.iastate.edu/faculty .) and have made all required disclosures.

☐ Yes ☒ No Do you or any member of your research team have an actual or potential conflict of interest?
☐ Yes ☐ No If yes, have the appropriate disclosure form(s) been completed?

SIGNATURES

Signature of Principal Investigator — Date: 10/18/05

Signature of Department Chair — Date: 10/18/05

PLEASE NOTE: Any changes to an approved protocol must be submitted to the appropriate committee(s) before the changes may be implemented.

Please proceed to SECTION II.

SECTION II: IRB SECTION - STUDY SPECIFIC INFORMATION

STUDY OBJECTIVES

Briefly explain in **language understandable to a layperson** the specific aim(s) of the study.

1) To assist educators in identifying the relationship between student-instructor interaction and course satisfaction, student-Teaching Assistance interaction and course satisfaction, student-student interaction and course satisfaction. 2) To identify the correlation between student's perception about the WebCT features help their learning effectiveness and their course satisfaction. 3) To determine the degree to which specific attributes such as students' performance, gender, academic status, prior distance education course experience, the level of student-instructor interaction, the level of student-Teaching Assistance interaction, and the level of student-student interaction can be used as predictors in determining students' course satisfaction.

BENEFIT

Explain in **language understandable to a layperson** how the information gained in this study will benefit participants or the advancement of knowledge, and/or serve the good of society.

The result of this study will be beneficial to the educators because it will help them to understand students' perceptions of the importanct of interaction in distance education. It will help educators in curriculum design as well.

PART A: PROJECT INVOLVEMENT

1) ☐ Yes ☒ No *Is this project part of a Training, Center, Program Project Grant?*
Director Name: Overall IRB ID:

2) ☒ Yes ☐ No Is the purpose of this project to develop survey instruments?

3) ☐ Yes ☒ No Does this project involve an investigational new drug (IND)? Number:

4) ☐ Yes ☒ No Does this project involve an investigational device exemption (IDE)? Number:

5) ☐ Yes ☒ No Does this project involve existing data or records?

6) ☐ Yes ☒ No Does this project involve secondary analysis?

7) ☐ Yes ☒ No Does this project involve pathology or diagnostic specimens?

8) ☐ Yes ☒ No Does this project require approval from another institution? Please attach letters of approval.

9) ☐ Yes ☒ No Does this project involve DEXA/CT scans or X-rays?

PART B: MEDICAL HEALTH INFORMATION OR RECORDS

1) ☐ Yes ☒ No Does your project require the use of a health care provider's records concerning past, present, or future physical, dental, or mental health information about a subject? The Health Insurance Portability and Accountability Act established the conditions under which protected health information may be used or disclosed for research purposes. If your project will involve the use of any past or present clinical information about someone, or if you will add clinical information to someone's treatment record (electronic or paper) during the study you must complete and submit the Application for Use of Protected Health Information.

PART C: ANTICIPATED ENROLLMENT

Estimated number of subjects *contacted* to reach required enrollment: 980	
Number of subjects to be enrolled in the study Total: 980 Males: unknown to percentage of male Females: unknown to percentages of male	
Check if any enrolled subjects are: ☐ Minors (Under 18) Age Range of Minors: ☐ Pregnant Women/Fetuses ☐ Cognitively Impaired ☐ Prisoners	Check below if this project involves either: ☐ Adults, non-students ☐ Minor ISU students ☒ ISU students 18 and older ☐ Other (explain)
List estimated percent of the anticipated enrollment that will be minorities *if known*:	
American Indian: unknown to percentage of American Indians	Alaskan Native: Unknown to percentages of Alaskan Native
Asian or Pacific Islander: Unknown to percentage of Asian or Pacific Islander	Black or African American: Unknown to percentages of Black or African American
Latino or Hispanic: Unknown to percentages of Latino	

PART D: SUBJECT SELECTION

Please use additional space as necessary to adequately answer each question.

11. Explain the procedures for selecting subjects including any inclusion/exclusion criteria (*i.e., Where will the names come from? Will a sample be purchased, will ads, fliers, word of mouth, email list, etc. be used?).*

The instructor was contacted. The email will be sent to students through WebCT.

12. Attach a copy of any recruitment telephone scripts or materials such as ad, fliers, e-mail messages, etc. Recruitment material must include a statement of the voluntary and confidential nature of the research. Do not include the amount of compensation, (e.g., compensation available).

Note: Please answer each question. If the question does not pertain to this study, please type not applicable (N/A).

PART E: RESEARCH PLAN

Include sufficient detail for IRB review of this project independent of the grant, protocol, or other documents.

13. Describe the flow of events used in this research protocol. Include information from the first contact with the volunteers to the end of the study. Use a diagram or flow chart if appropriate. Also, include a description of the study procedures or tasks that participants will be exposed to or asked to complete. This information is intended to inform the committee of the procedures used in the study and their potential risk. Please do not respond with "see attached" or "not applicable."

The subjects need to fill out a survey in WebCT.

14. For studies involving pathology/diagnostic specimens, indicate whether specimens will be collected prospectively and/or already exist "on the shelf" at the time of submission of this review form. If prospective, describe specimen procurement procedures; indicate whether any additional medical information about the subject is being gathered, and whether specimens are linked at any time by code number to the subject's identity. If this question is not applicable, please type N/A in the response cell.

N/A

15. For studies involving deception, please justify the deception and indicate the debriefing procedure, including the timing and information to be presented to subjects. If this question is not applicable, please type N/A in the response cell.

N/A

PART F: CONSENT PROCESS

16. Describe the consent process for participants who are age 18 and older. *If the consent process does not include documented consent, a waiver of documentation of consent must be requested.*

The subject will be contacted through email. All of the subjects are age 18 and older.

17. If your study involves minors, please explain how parental consent will be obtained prior to enrollment of the minor(s).

N/A.

18. Please explain how assent will be obtained from minors (younger than 18 years of age), prior to their enrollment. Also, please explain if the assent process will be documented (*e.g., a simplified version of the consent form, combined with the parental informed consent document).* According to the federal regulations assent "...means a child's affirmative agreement to participate in research. Mere failure to object should not, absent affirmative agreement, be construed as assent."

N/A.

PART G: DATA ANALYSIS

19. Describe how the data will be analyzed (*e.g. statistical methodology, statistical evaluation, statistical measures used to evaluate results*)

The SPSS software will be used to analyze the data.

20. If applicable, please indicate the anticipated date that identifiers will be removed from completed survey instruments and/or audio or visual tapes will be erased:

8/30/06 Month/Day/Year

PART H: BENEFITS

21. Describe the benefit to the volunteer from participating in this study, *if any,* and the benefit to society that will be gained from the study. Please note that monetary compensation is not considered a benefit.

The result of this study will be beneficial to the educators because it will help them to understand students' perceptions of the importanct of interaction in distance education. It will help educators in curriculum design as well.

PART I: RISKS

The concept of risk goes beyond physical risk and includes risks to subjects' dignity and self-respect as well as psychological, emotional, legal, social or financial risk.

22. ☐ Yes ☒ No Is the ***probability*** of the harm or discomfort anticipated in the proposed research greater than that encountered ordinarily in daily life or during the performance of routine physical or psychological examinations or tests?

23. ☐ Yes ☒ No Is the ***magnitude*** of the harm or discomfort greater than that encountered ordinarily in daily life, or during the performance of routine physical or psychological examinations or tests?

24. Describe any risks or discomforts to the subjects and how they will be minimized and precautions taken. Do ***not*** respond with N/A. If you believe that there will not be risk or discomfort to subjects you must explain why.

There is no risk because the subjects only need to fill out a survey form.

25. If this study involves vulnerable populations, including minors, pregnant women, prisoners, educationally or economically disadvantaged, what additional protections will be provided to minimize risks?

N/A

PART J: COMPENSATION

26. ☐ Yes ☒ No Will subjects receive compensation for their participation? If yes, please explain.

Do not make the payment an inducement, only a compensation for expenses and inconvenience. If a person is to receive money or another token of appreciation for their participation, explain when it will be given and any conditions of full or partial payment. (E.g., volunteers will receive $5.00 for each of the five visits in the study or a total of $25.00 if he/she completes the study. If a participant withdraws from participation, they will receive $5.00 for each of the visits completed.) It is considered undue influence to make completion of the study the basis for compensation.

N/A

PART K: CONFIDENTIALITY

27. Describe below the methods that will be used to ensure the confidentiality of data obtained. For example,, who has access to the data, where the data will be stored, security measures for web-based surveys and computer storage, how long data (specimens) will be retained, etc.)

Only the investigator can access to the data, the data will be stored in password protected computer files. It will be retained until end of August, 2006.

PART L: REGISTRY PROJECTS

To be considered a registry: (1) the individuals must have a common condition or demonstrate common responses to questions; (2) the individuals in the registry might be contacted in the future; and (3) the names/data of the individuals in the registry might be used by investigators other than the one maintaining the registry.

☐ Yes ☒ No Does this project establish a registry?

If "yes," please provide the registry name below.

Checklist for Attachments

The following are attached (please check ones that are applicable):

☒ A copy of the informed consent document **OR** ☐ Letter of introduction to subjects containing the elements of consent
☒ A copy of the assent form if minors will be enrolled
☐ Letter of approval from cooperating organizations or institutions allowing you to conduct research at their facility
☒ Data-gathering instruments (including surveys)
☒ Recruitment fliers, phone scripts, or any other documents or materials the subjects will see

Two sets of materials should be submitted for each project – the original signed copy of the application form and one copy and two sets of accompanying materials. **Federal regulations require that one copy of the grant application or proposal be submitted for comparison with the application for approval.**

FOR IRB USE ONLY:

Initial action by the Institutional Review Board (IRB):

☒ Project approved. Date: 11/9/05 05-482
☐ Pending further review. Date: _____
☐ Project not approved. Date: _____

Follow-up action by the IRB:

Dianne Anderson — IRB Approval Signature

11/9/05 — Date

SECTION III: ENVIRONMENTAL HEALTH AND SAFETY INFORMATION

☐ Yes ☒ No Does this project involve human cell or tissue cultures (primary OR immortalized), or human blood components, body fluids or tissues? If the answer is "no", please proceed to SECTION III: APPLICATION FOR IRB APPROVAL. If the answer is "yes," please proceed to Part A: Human Cell Lines.

PART A: HUMAN CELL LINES

☐ Yes ☒ No Does this project involve human cell or tissue cultures (primary OR immortalized cell lines/strains) that have been documented to be free of bloodborne pathogens? If the answer is "yes," please attach copies of the documentation. If the answer is "no," please answer question 1 below.

1) Please list the specific cell lines/strains to be used, their source and description of use.

CELL LINE	SOURCE	DESCRIPTION OF USE
N/A		

Add New Row

Checklist for Attachments

The following are attached (please check ones that are applicable):

☒ A copy of the informed consent document **OR** ☐ Letter of introduction to subjects containing the elements of consent
☐ A copy of the assent form if minors will be enrolled
☐ Letter of approval from cooperating organizations or institutions allowing you to conduct research at their facility
☒ Data-gathering instruments (including surveys)
☒ Recruitment fliers, phone scripts, or any other documents or materials the subjects will see

Two sets of materials should be submitted for each project – the original signed copy of the application form and one copy and two sets of accompanying materials. **Federal regulations require that one copy of the grant application or proposal be submitted for comparison with the application for approval.**

FOR IRB USE ONLY:

Initial action by the Institutional Review Board (IRB):

☐ Project approved. Date: _____
☐ Pending further review. Date: _____
☐ Project not approved. Date: _____

Follow-up action by the IRB:

_____ _____
IRB Approval Signature Date

SECTION III: ENVIRONMENTAL HEALTH AND SAFETY INFORMATION

☐ Yes ☒ No Does this project involve human cell or tissue cultures (primary OR immortalized), or human blood components, body fluids or tissues? If the answer is "no", please proceed to SECTION III: APPLICATION FOR IRB APPROVAL. If the answer is "yes," please proceed to Part A: Human Cell Lines.

PART A: HUMAN CELL LINES

☐ Yes ☒ No Does this project involve human cell or tissue cultures (primary OR immortalized cell lines/strains) that have been documented to be free of bloodborne pathogens? If the answer is "yes," please attach copies of the documentation. If the answer is "no," please answer question 1 below.

1) Please list the specific cell lines/strains to be used, their source and description of use.

CELL LINE	SOURCE	DESCRIPTION OF USE
N/A		

Add New Row

APPENDIX B

STUDENT'S PERCEIVED INTERACTION SURVEY - PILOT VERSION

Please indicate the extent to which you agree with the following statements.
Scale: a = Strongly Disagree
b = Disagree
c = Slightly Disagree
d = Slightly Agree
e = Agree
f = Strongly Agree

1. I was responsible for my learning in this class.
   a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree f) Strongly Agree

2. I worked on the course assignments during times I found convenient.
   a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree f) Strongly Agree

3. I was motivated by many opportunities to be successful in this class.
   a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree f) Strongly Agree

4. I contributed my viewpoints to this class.
   a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree f) Strongly Agree

5. I sought my own answers in this class.
   a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree f) Strongly Agree

6. I have used WebCT for:
   a) 0 - 3 months b) 4 - 6 months c) 7 -12 months d) more than 1 year e) more than 2 years f) more than 3 years

7. When I had questions about this course, the WebCT "E-mail" feature helped me contact other people involved with the course to solve my problems..
   a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree f) Strongly Agree

8. The WebCT "Discussion Board" feature helped me interact with my classmates in this class.
   a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree f) Strongly Agree

9. The WebCT "My Grade" feature helped me track my progress in this class.
   a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree f) Strongly Agree

10. The WebCT "Assessment – Quiz and Test" feature helped me grasp the course material better in this class.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree f) Strongly Agree

11. The WebCT "Calendar" feature was helpful to me in time management in this class.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

12. The "Syllabus" feature helped me understand general information about this course.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

13. The WebCT "Weekly Module" feature helped me keep track of my course assignments each week in this class.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

14. The WebCT "Course Menu" helped me navigate this course information.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

15. The WebCT "Student Homepage" feature helped students get to know each other in this class.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

16. The WebCT "Chat" feature helped me to interact with other people involved with this course.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree g) Not applicable

17. In general, I found that WebCT features are easy to learn in this class.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

18. My section TA was prompt in replying to my questions.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

19. My section TA was fair in grading assignments.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

20. I contacted my TA if I had any questions regarding the course.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

21. My section TA was easy to interact with.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

22. Overall, I was satisfied with my section TA.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

23. The instructor was knowledgeable of the subject matter.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

24. The instructor organized the course material well.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

25. In general, the instructor explained the course material clearly through WebCT.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

26. The instructor was prompt in replying to my questions.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

27. The instructor gave me feedback on my case study projects.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

28. The instructor sent weekly emails to provide updated information about this course.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

29. The instructor promoted collaboration among fellow students when they were encouraged to work together on projects.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

30. The streaming lectures produced by the instructor helped me to learn the course material.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

31. The instructor asked students questions in the weekly homework assignment.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

32. The instructor encouraged students to interact with each other in class discussions, such as discussion board case study, chat session.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

33. I felt the instructor was accessible to my questions.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

34. In the future, I would take another course with the same instructor.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

35. The amount of interaction with the instructor was adequate in this class.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree
e) Agree f) Strongly Agree

36. Overall, I am satisfied with my instructor.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

37. I collaborated with other students in this class when we worked on group projects
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

38. I posted my case study project on the discussion board for other people to view it.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

39. I posted my comments on the discussion board when I viewed other students' case study projects.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

40. I received peer feedback about my case study projects.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

41. I shared my personal information with other students when we did the student homepage project.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

42. I developed a friendship with at least one student in this course.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

43. I used e-mail to contact fellow students.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree
e) Agree f) Strongly Agree

44. This course promoted interaction among the students.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

45. In general, my interaction with students in this class was adequate.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

46. In general, how many hours do you spend in WebCT virtual classroom weekly?
_____hours

47. In general, how many times did you check the WebCT e-mails weekly?
a) 1 b) 3 c) 5 d) 7 e) More than 7

48. In general, how many hours did you spend reading the online course material weekly?
_____hours

49. In general, how many hours do you spend watching the streaming lectures weekly?
_____hours

50. In general, how satisfied were you with the course contents?
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree
e) Agree f) Strongly Agree

51. The way the course materials were organized on WebCT facilitated easy navigation.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

52. The "Orientation Session" in the beginning of the semester helped me learn about this course.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree g) Not applicable

53. The assignments helped me to better understand the course.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

54. The streaming lectures helped me learn the course material
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

55. This course promoted interaction between students and instructors.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

56. I found the required textbooks for this course to be relevant.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

57. I prefer web-based courses as opposed to face-to-face lecture courses.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

58. This course allowed me more flexibility when managing my time to schedule the rest of my coursework and activities.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

59. I put a lot of effort into this course.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

60. In general, the weekly activities progressed at a fair pace in this course.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

61. I could access the course materials in a timely manner.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

62. When I had questions, I knew that I could go to the face-to-face help desk for assistance
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

63. The student homepage project helped students to get to know each other better in the building of an online community.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

64. I enjoyed this class.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

65. I felt isolated and alone while taking this course
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

66. The instructor provides office hours for students in this class.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

67. I would recommend this course to my friends.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

68. Taking this course has improved my overall computer knowledge.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

69. I felt comfortable using technology to communicate with other people involved with the course
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

70. After I took this class, my attitude about having a completely online class environment was positive.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

71. I felt I belonged to a community in this class.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

72. I would enroll in another web-based course.
    a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
    f) Strongly Agree

73. How many courses have you taken that were partially online? _____

74. How many courses have you taken that were entirely online? _____

75. I took this course because it was a required course for my major.
a) Yes b) No

76. This course met my expectations.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

77. The online material was easily accessible.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

78. The course policies were clear.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

79. The course materials met my learning needs.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

80. The web links provided in the material were clear.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

81. When I studied for this course, my Internet connection was reliable.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

82. When I studied for this course, my Internet connection was fast.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

83. Overall, I was satisfied with this course.
a) Strongly Disagree b) Disagree c) Slightly Disagree d) Slightly Agree e) Agree
f) Strongly Agree

84. My age is:
a) under 17 b) 18-25 c) 26 – 30 d) 31-40 e) 41-50 f) above 50

85. My gender is:
a) Male b) Female

86. My GPA.
a) Below 1.75 b) 1.76 – 2.25 c) 2.26 – 2.75 d)2.76 – 3.25 d) Above 3.26

87. My job employment status is:
a) Full-Time b) Part-Time c) Unemployed

88. My academic status is:
    a) Freshman b) Sophomore c) Junior d) Senior

89. My major or intended major is in the area (college) of:
    a) Agriculture b) Business c) Design d) Human Science
    e) Engineering f) Liberal Arts and Sciences g) Veterinary Medicine h) Other

90. My ethnicity is:
    a) American Indian or Alaskan Native
    b) Asian
    c) Black/African – American
    d) Hispanic, Latino
    e) Multi-ethnic
    f) Native Hawaiian/Pacific Islander
    g) White
    h) Other: _____

91. Other Comments: _____

92. Do you need more detailed instructions to finish this survey? If yes, please write down question # and your suggestions. _____

93. Is there any ambiguous questions (unclear)? If yes, please write down the question # and your suggestions. _____

94. Is the length of the survey okay? _____

95. How long does it take you to finish this survey? _____

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APPENDIX C

STUDENTS' PERCEIVED INTERACTION SURVEY - FINAL VERSION

Please indicate the extent to which you agree with the following statements.
Scale: a = Strongly Agree
b = Agree
c = Slightly Agree
d = Slightly Disagree
e = Disagree
f = Strongly Disagree

1. When I had questions about this course, the WebCT "E-mail" feature helped me contact other people involved with the course to solve my problems.
   a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
   e) Disagree f) Strongly Disagree

2. The WebCT "Discussion Board" feature helped me view my classmates' projects.
   a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
   e) Disagree f) Strongly Disagree

3. The WebCT "My Grades" feature helped me track my progress in this class.
   a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
   e) Disagree f) Strongly Disagree

4. The WebCT "Assessment – Quiz and Test" feature helped me to assess my knowledge of the course material.
   a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
   e) Disagree f) Strongly Disagree

5. The WebCT "Calendar" feature helped me to be familiar with the semester class schedule.
   a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
   e) Disagree f) Strongly Disagree

6. The WebCT "Weekly Module" feature helped me keep track of my course assignments each week.
   a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
   e) Disagree f) Strongly Disagree

7. The WebCT "Student Homepage" feature helped me to get to know other students in this class.
   a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
   e) Disagree f) Strongly Disagree

8. The WebCT "Chat" feature helped me to interact with other people involved with this course.
   a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
   e) Disagree f) Strongly Disagree g) Not Applicable

9. In general, I found this class's WebCT features easy to learn.
   a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
   e) Disagree f) Strongly Disagree

10. My section TA tried his/her best to respond to my emails within 24 hours.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

11. My section TA was fair in grading assignments.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

12. My section TA was easy to interact with.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

13. When I had questions, I knew that I could go to the face-to-face help desk for assistance.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

14. I met my instructor in the face-to-face orientation session at the beginning of the semester.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree g) Not Applicable

15. In general, my grade book on WebCT was updated frequently in this course.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

16. I received weekly WebCT emails containing updated information for this course from the instructor.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

17. I knew that I could send an email to my instructor if I had any questions regarding this course.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

18. I sent emails to my instructor (or replied to emails from my instructor) in this class.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

19. The instructor of this course tried her best to respond to my emails within 24 hours.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree g) Not Applicable

20. I attended the real-time chat session in this course.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

21. The instructor provided office hours for students in this class.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

22. I received comments about my performance from the instructor in this course.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

23. In this course, I was given opportunities to comment on other students' case study projects on the discussion board.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

24. In total, I answered about _____ questions in the "weekly homework one" assignments in this class. (There are two homework each week.)
    a) 41 and above b) 31 – 40 c) 21 – 30 d) 11 – 20
    e) 1 – 10 f) 0

25. In this class, I was given opportunities to work with another student on case study group projects.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

26. I worked with a partner for at least one of the case study projects in this class.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

27. In this class, I (or my group mate, if I had one) posted my case study project on the discussion board so that other students in my section could view it.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

28. I sent emails to contact other students in this class.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

29. This course provided opportunities for students to get to know each other better in the online community.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

30. In total, about how many comments did you post on the discussion board when you evaluated other students' projects?
    a) 100 and above b) 81 - 99 c) 71 - 80 d) 61-70
    e) 41 - 60 f) 1 - 40g) 0

31. In total, about how many comments did you **receive** from other students regarding your projects in this class?
    a) 100 and above b) 81 - 99 c) 71 - 80 d) 61-70
    e) 41 - 60 f) 1 - 40g) 0

32. In general, how many hours did you spend logged into WebCT for this class each week?
    a) greater than 12 hours
    b) greater than 9 and less than or equal to 12 hours
    less than or equal to 1 hour
    b) greater than 1 and less than or equal to 3 hours
    c) greater than 3 and less than or equal to 6 hours
    d) greater than 6 and less than or equal to 9 hours

e) greater than 9 and less than or equal to 12 hours
f) greater than 12 hours

33. In general, how many hours each week did you spend reading the online course material in WebCT for this class?
    a) less than or equal to 1 hour
    b) greater than 1 and less than or equal to 2 hours
    c) greater than 2 and less than or equal to 4 hours
    d) greater than 4 and less than or equal to 6 hours
    e) greater than 6 and less than or equal to 8 hours
    f) greater than 8 hours

34. On average, how many hours each week did you spend watching the streaming lectures for this class?
    a) 0
    b) less than or equal to 1 hour
    c) greater than 1 and less than or equal to 2 hours
    d) greater than 2 and less than or equal to 4 hours
    e) greater than 4 and less than or equal to 6 hours
    f) greater than 6 hours

35. In general, how many times did you check the WebCT e-mails for this class each week?
    a) 1 to 2 times
    b) 3 to 5 times
    c) 6 to 8 times
    d) 9 to 11 times
    e) 12 to 13 times
    f) greater than 13 times

36. In general, how many hours did you spend on the Office 2003 hands-on assignments each week for this course?
    a) less than or equal to 1 hour
    b) greater than 1 and less than or equal to 4 hours
    c) greater than 4 and less than or equal to 6 hours
    d) greater than 6 and less than or equal to 8 hours
    e) greater than 8 and less than or equal to 10 hours
    f) greater than 10 hours

37. On average, how many hours per week did you spend on this course?
    a) less than or equal to 1 hour
    b) greater than 1 and less than or equal to 4 hours
    c) greater than 4 and less than or equal to 6 hours
    d) greater than 6 and less than or equal to 8 hours
    e) greater than 8 and less than or equal to 10 hours
    f) greater than 10 hours

38. This course provided me with more flexibility than a traditional class, allowing me to better manage my time when completing the coursework.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

39. I found the required textbooks for this course to be relevant.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

40. The course policies in the syllabus were clear.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

41. The assignments helped me to better understand the course material.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

42. The course materials on WebCT were well-organized.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

43. The quality of the streaming lectures was satisfactory.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

44. The weekly module course material was available every Monday.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

45. In general, the content for this course was satisfactory.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

46. Overall, I enjoyed this class.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

47. I am satisfied with the amount of learning I achieved in this class.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

48. Overall, I was satisfied with this course.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

49. I worked independently throughout this course with the attitude that I needed to take responsibility for my own learning.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

50. I worked on the course assignments for this class during times I found convenient.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

51. I was self-motivated to complete all academic coursework to the best of my ability in this class.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

52. I actively participated in activities provided throughout this course that allowed me to contribute my own viewpoints.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

53. I took this course because it was a required course for my major.
    a) Yes b) No

54. For this particular course, I preferred the web-based setting to a traditional face-to-face lecture setting.
    a) Yes b) No

55. Before taking this course, I had taken _____ course(s) that were partially online. (for example, the course met face-to-face, but the instructor used WebCT or another online management system as a supplemental tool).
    a) 0 b) 1 c) 2
    d) 3 e) More than 3

56. Before taking this course, I had taken _____ course(s) that were entirely online.
    a) 0 b) 1 c) 2
    d) 3 e) More than 3

57. Before I took this course, I have used WebCT for:
    a) 0-3 months b) 4-6 months c) 7-12 months
    d) more than 1 year e) more than 2 years f) more than 3 years

58. When I accessed this online course, the speed of my Internet connection was slow.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

59. When I accessed this course, WebCT was slow.
    a) Strongly Agree b) Agree c) Slightly Agree d) Slightly Disagree
    e) Disagree f) Strongly Disagree

60. My age group is:
    a) 18-25 b) 26 – 30 c) 31-40
    d) 41-50 e) 51 – 60 f) 61 or older

61. My gender is:
    a) Male b) Female

62. My GPA is:
    a) Below 1.76 b) 1.76 – 2.25 c) 2.26 – 2.75
    d) 2.76 – 3.25 e) 3.26 or above

63. My job employment status while taking this class was:
    a) Full-Time b) Part-Time c) Unemployed

64. My academic status is:
    a) Freshman b) Sophomore c) Junior d) Senior

65. My primary major or intended major is in the area (college) of:
    a) Agriculture b) Business c) Design d) Human Sciences
    e) Engineering f) Liberal Arts and Sciences g) Veterinary Medicine
    h) Other

66. My ethnicity is:
    a) American Indian or Alaskan Native
    b) Asian
    c) Black/African – American
    d) Hispanic, Latino
    e) Multi-ethnic
    f) Native Hawaiian/Pacific Islander
    g) White
    h) Other

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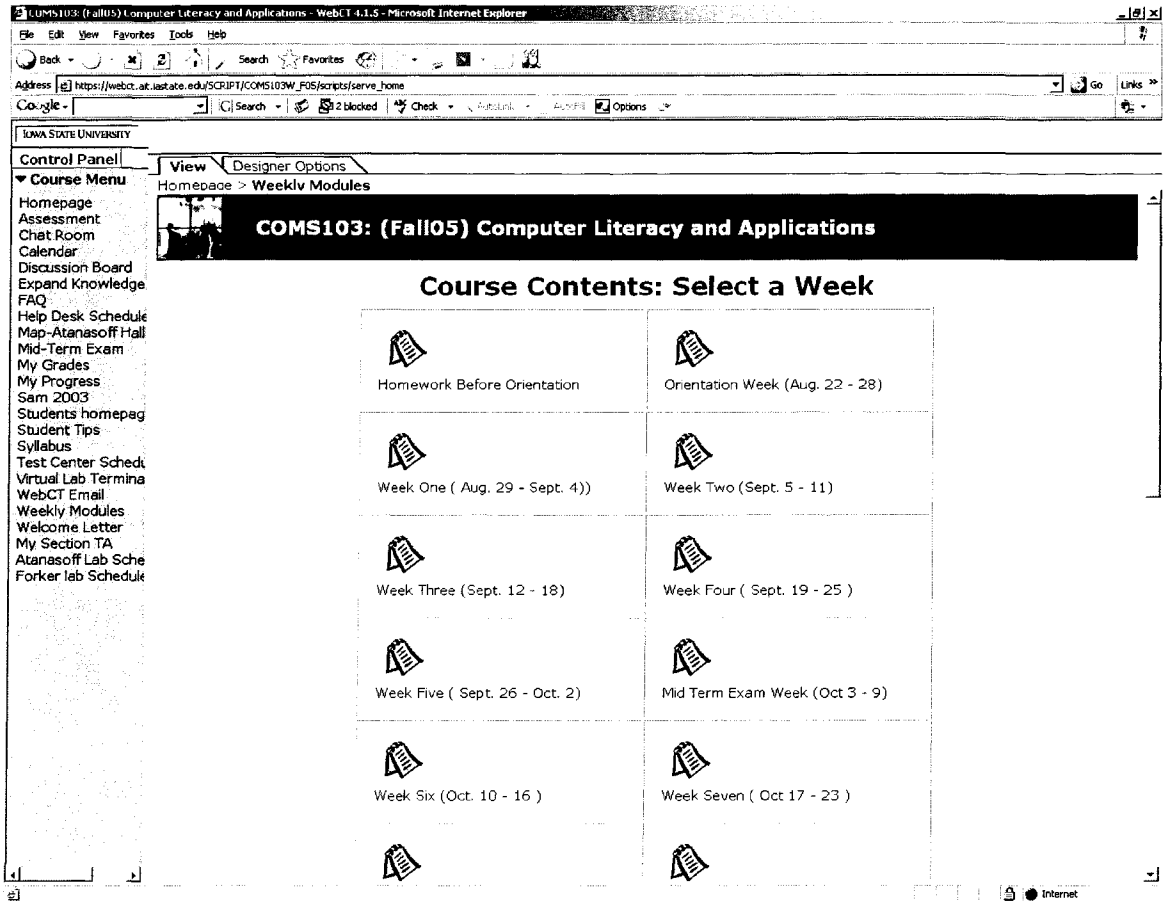
APPENDIX D

WEEKLY MODULE


COMS103: (Fall05) Computer Literacy and Applications - WebCT 4.1.5 - Microsoft Internet Explorer
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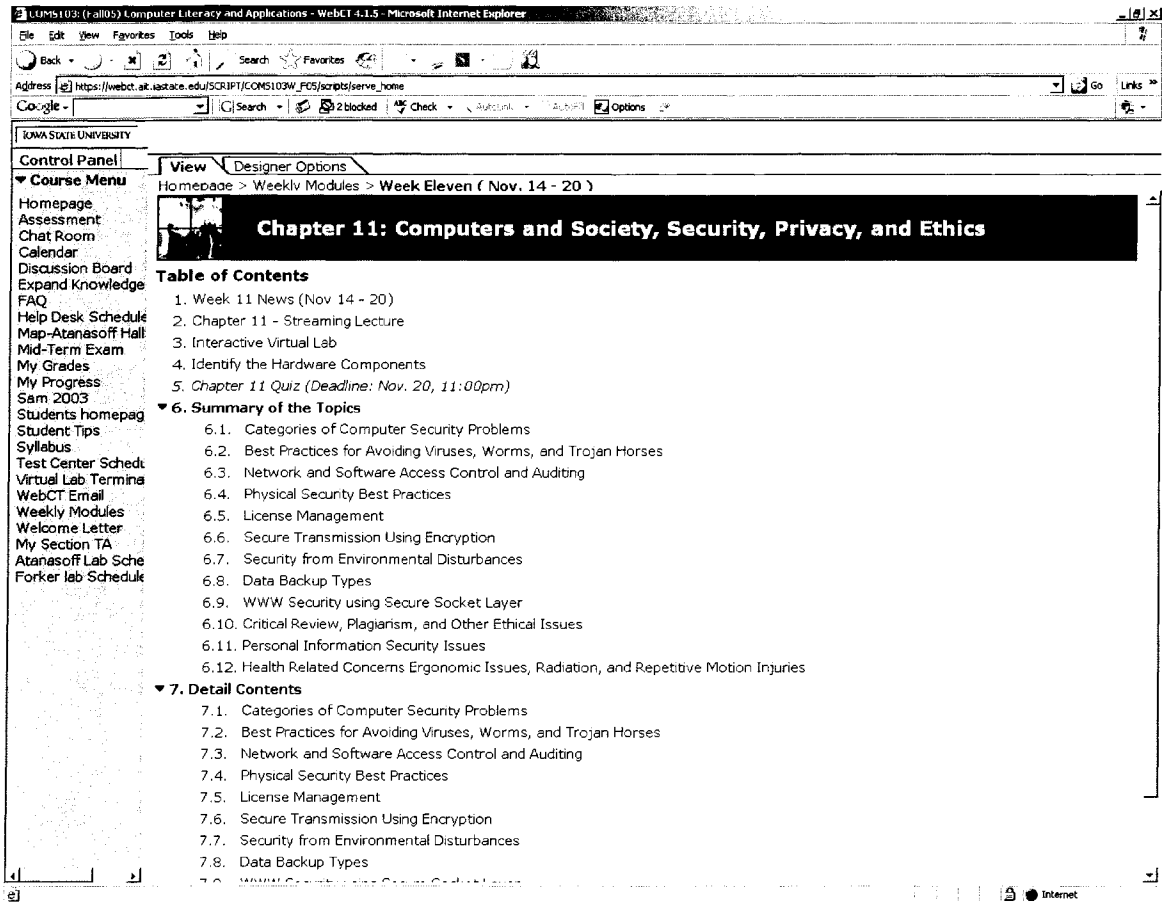
IOWA STATE UNIVERSITY
Control Panel
Course Menu
Homepage
Assessment
Chat Room
Calendar
Discussion Board
Expand Knowledge
FAQ
Help Desk Schedule
Map-Atanasoff Hall
Mid-Term Exam
My Grades
My Progress
Sam 2003
Students homepag
Student Tips
Syllabus
Test Center Sched
Virtual Lab Termina
WebCT Email
Weekly Modules
Welcome Letter
My Section TA
Atanasoff Lab Sche
Forker lab Schedule
View
Designer Options
Homepage > Weekly Modules
COMS103: (Fall05) Computer Literacy and Applications
Course Contents: Select a Week
Homework Before Orientation
Orientation Week (Aug. 22 - 28)
Week One (Aug. 29 - Sept. 4))
Week Two (Sept. 5 - 11)
Week Three (Sept. 12 - 18)
Week Four (Sept. 19 - 25)
Week Five (Sept. 26 - Oct. 2)
Mid Term Exam Week (Oct 3 - 9)
Week Six (Oct. 10 - 16)
Week Seven (Oct 17 - 23)
Internet

APPENDIX E

WEEK 11 MODULE


COMS103: (Fall05) Computer Literacy and Applications - WebCT 4.1.5 - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
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Go Links
Google Search 2 blocked Check Options
IOWA STATE UNIVERSITY
Control Panel
Course Menu
Homepage
Assessment
Chat Room
Calendar
Discussion Board
Expand Knowledge
FAQ
Help Desk Schedule
Map-Atanasoff Hall
Mid-Term Exam
My Grades
My Progress
Sam 2003
Students homepag
Student Tips
Syllabus
Test Center Schedu
Virtual Lab Termina
WebCT Email
Weekly Modules
Welcome Letter
My Section TA
Atanasoff Lab Sche
Forker lab Schedule
View
Designer Options
Homepage > Weekly Modules > Week Eleven (Nov. 14 - 20)
Chapter 11: Computers and Society, Security, Privacy, and Ethics
Table of Contents
1. Week 11 News (Nov 14 - 20)
2. Chapter 11 - Streaming Lecture
3. Interactive Virtual Lab
4. Identify the Hardware Components
5. Chapter 11 Quiz (Deadline: Nov. 20, 11:00pm)
6. Summary of the Topics
6.1. Categories of Computer Security Problems
6.2. Best Practices for Avoiding Viruses, Worms, and Trojan Horses
6.3. Network and Software Access Control and Auditing
6.4. Physical Security Best Practices
6.5. License Management
6.6. Secure Transmission Using Encryption
6.7. Security from Environmental Disturbances
6.8. Data Backup Types
6.9. WWW Security using Secure Socket Layer
6.10. Critical Review, Plagiarism, and Other Ethical Issues
6.11. Personal Information Security Issues
6.12. Health Related Concerns Ergonomic Issues, Radiation, and Repetitive Motion Injuries
7. Detail Contents
7.1. Categories of Computer Security Problems
7.2. Best Practices for Avoiding Viruses, Worms, and Trojan Horses
7.3. Network and Software Access Control and Auditing
7.4. Physical Security Best Practices
7.5. License Management
7.6. Secure Transmission Using Encryption
7.7. Security from Environmental Disturbances
7.8. Data Backup Types
Internet

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